

Pelvic and Acetabular Anatomy

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Pelvic Ring Anatomy

- Learn the anatomy of the pelvis and acetabulum
 - Osteology
 - Ligamentous
 - Muscular
 - Neurovascular
- Differentiate the palpable landmarks

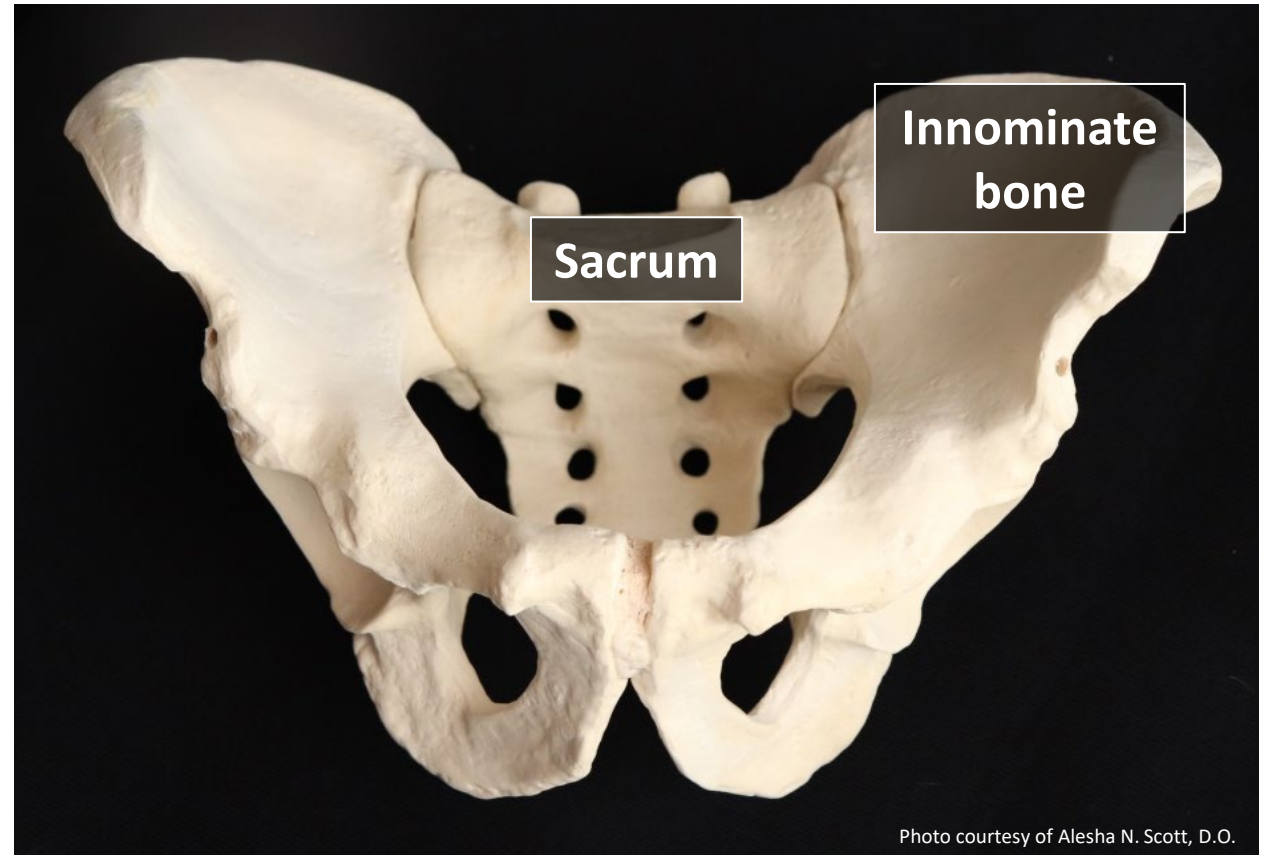
Pelvic Ring Anatomy

- Osteology
- Ligamentous
- Muscular
- Neurovascular

Pelvic Osteology

3 bones

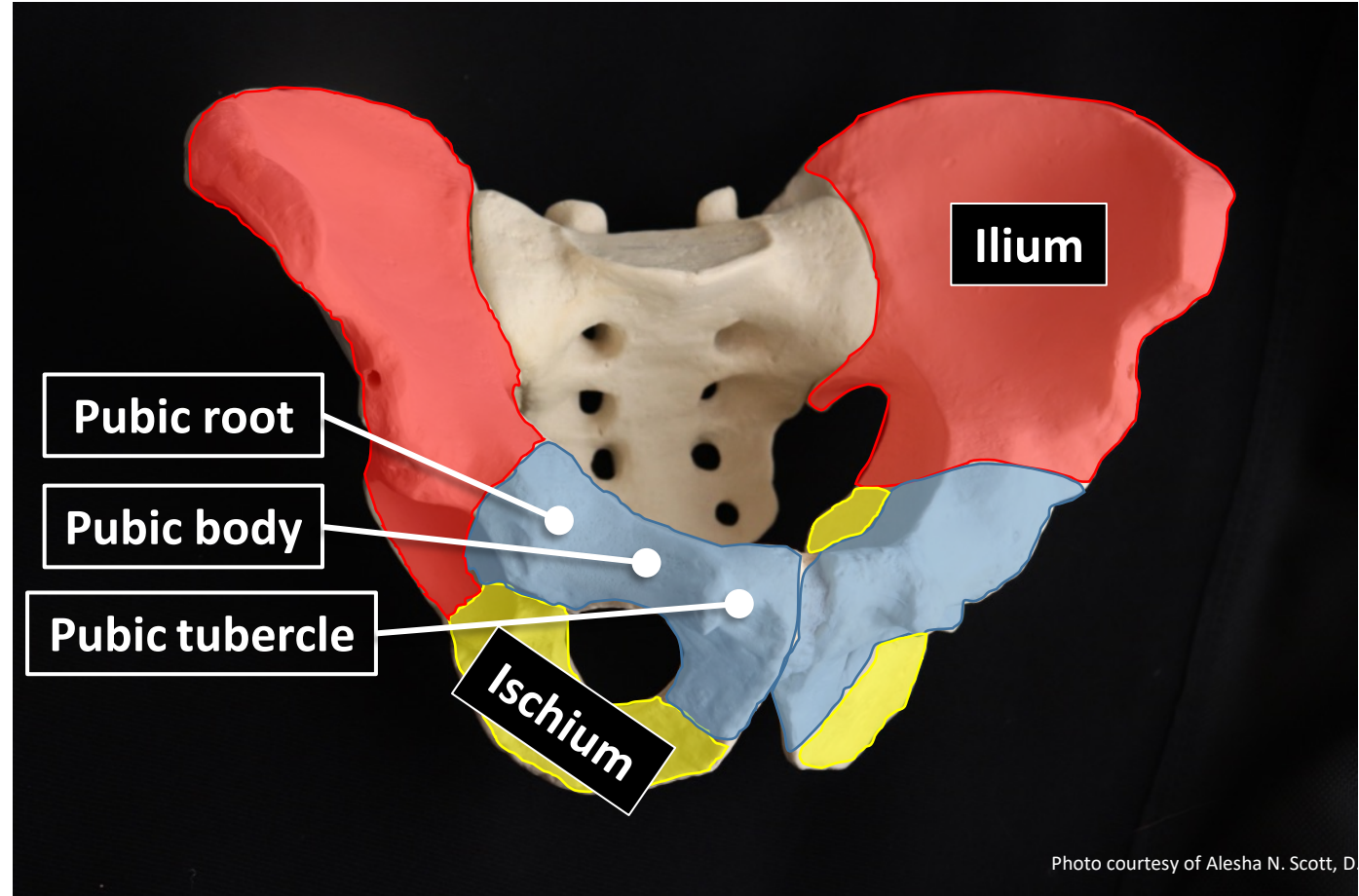
- Innominate bones x2
- Sacrum



Pelvic Osteology

Innominate Bone

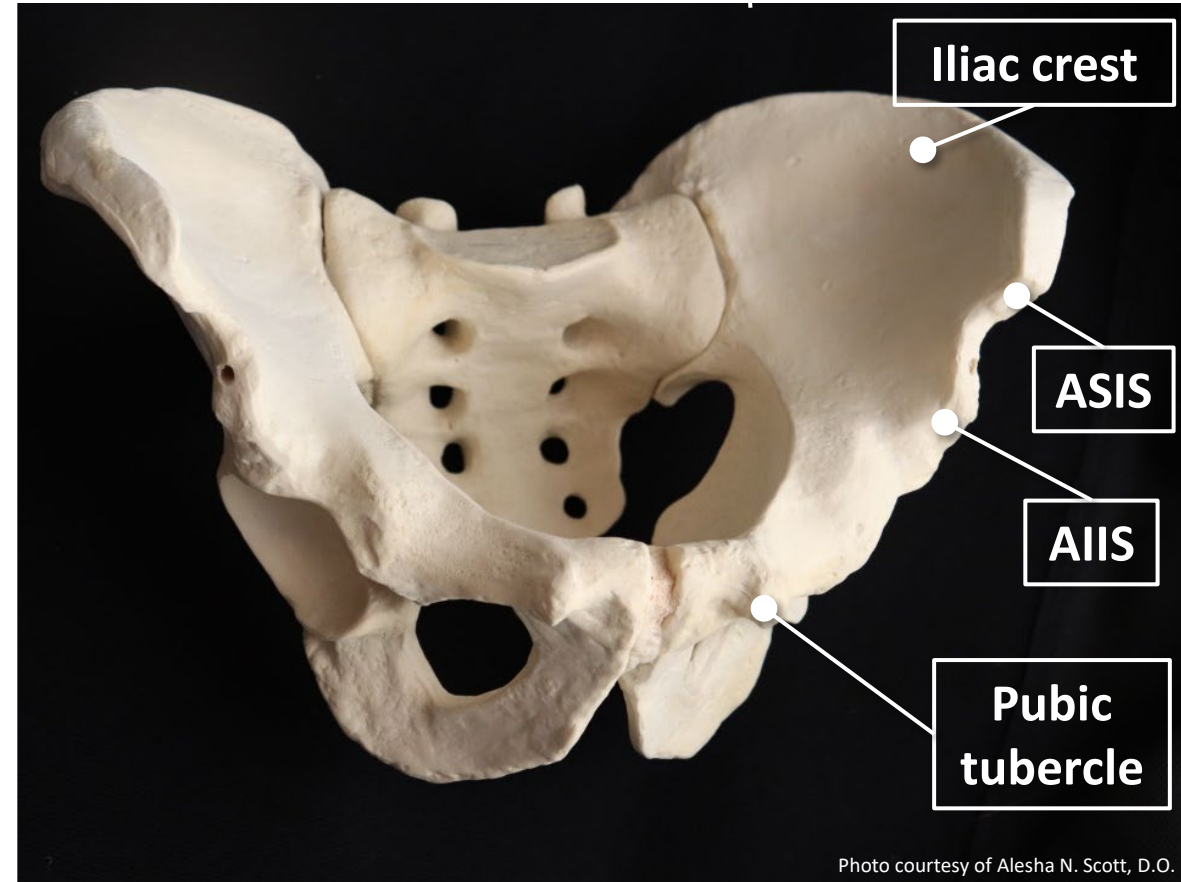
- Ilium
- Pubis
 - Pubic root
 - Pubic body
 - Pubic tubercle
- Ischium



Pelvic Osteology

Palpable Anterior Landmarks

- Iliac crest
- Anterior superior iliac spine (ASIS)
- Anterior inferior iliac spine (AIIS)
- Pubic tubercle



Pelvic Osteology

Palpable Posterior Landmarks

- Iliac crest
- Posterior superior iliac spine (PSIS)
- Ischial tuberosity

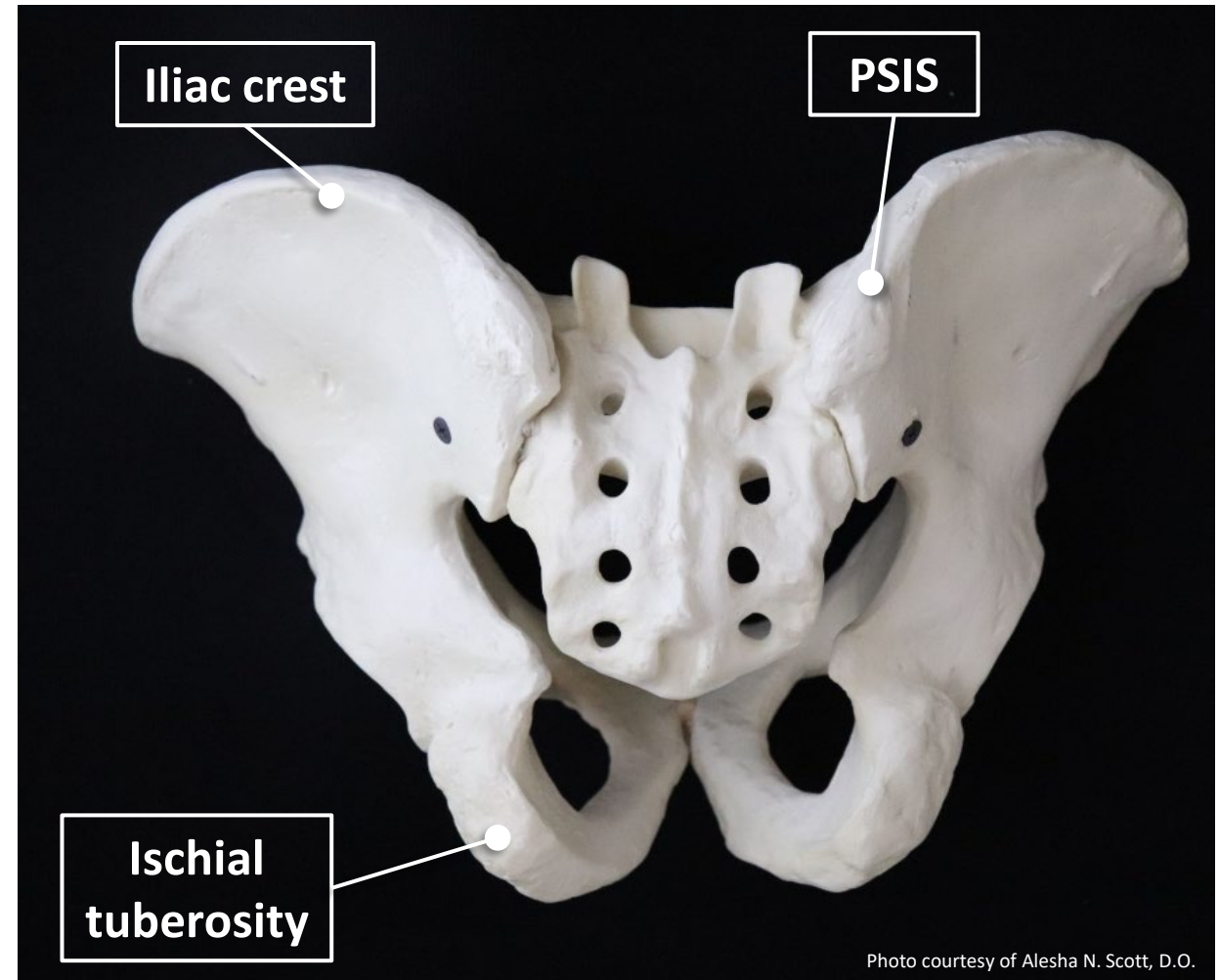
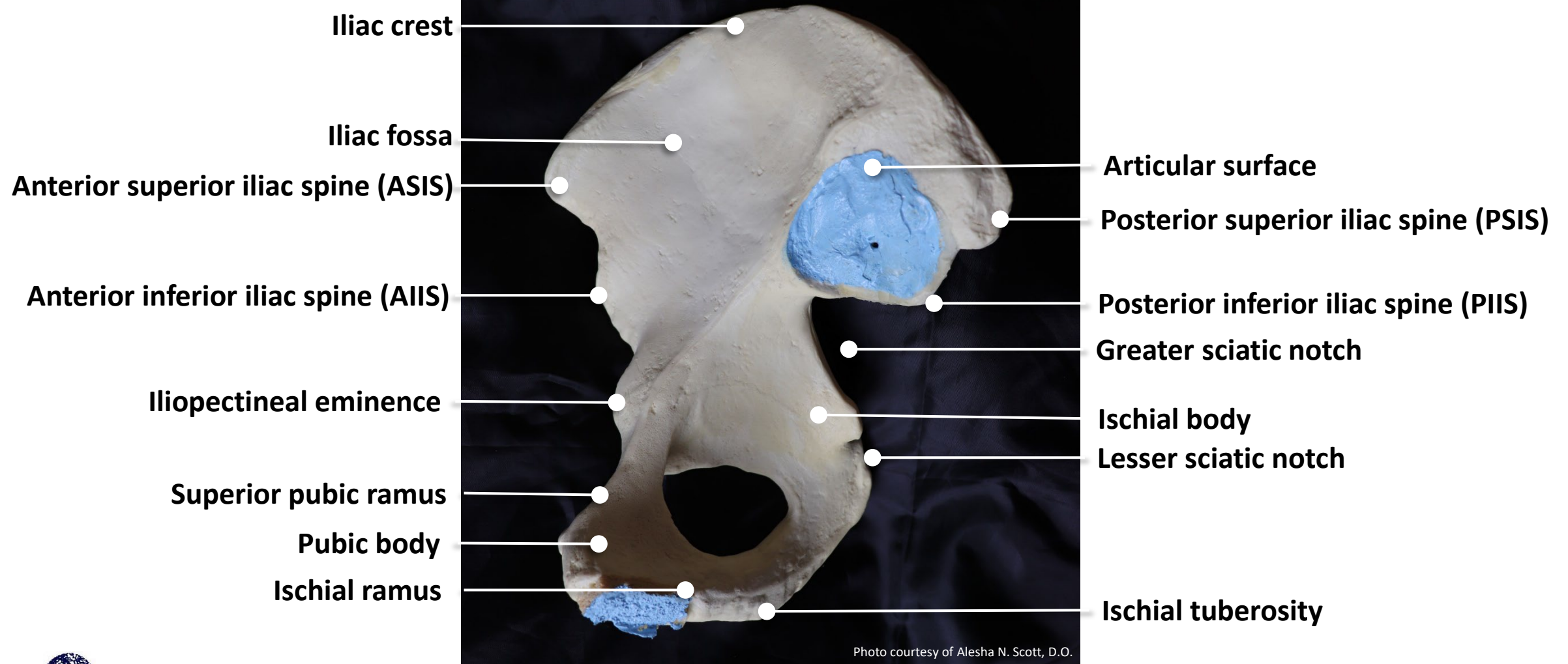


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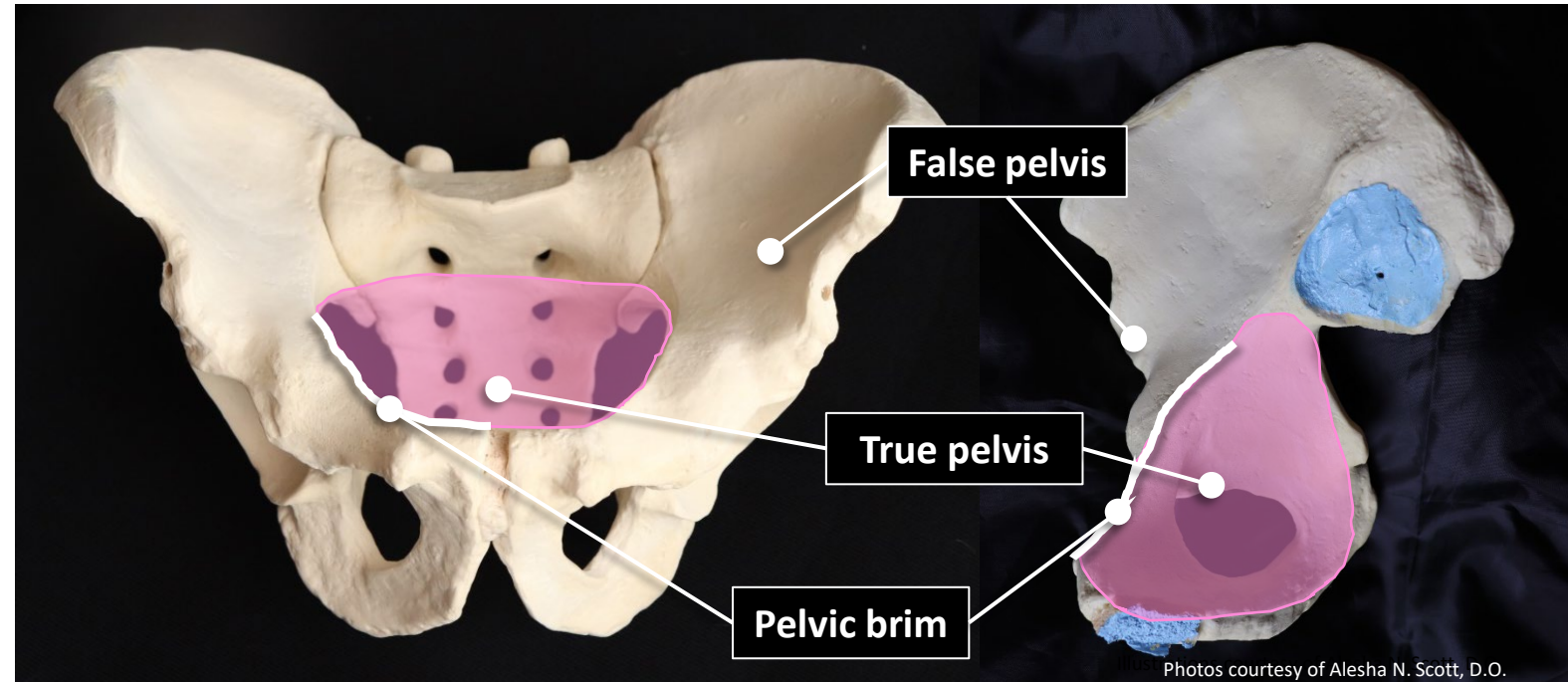
Pelvic Osteology



Pelvic Osteology

False and True Pelvis

- False pelvis
 - Cranial to the pelvic brim
 - Sacral ala + iliac fossae
- True pelvis
 - Caudal to the pelvic brim

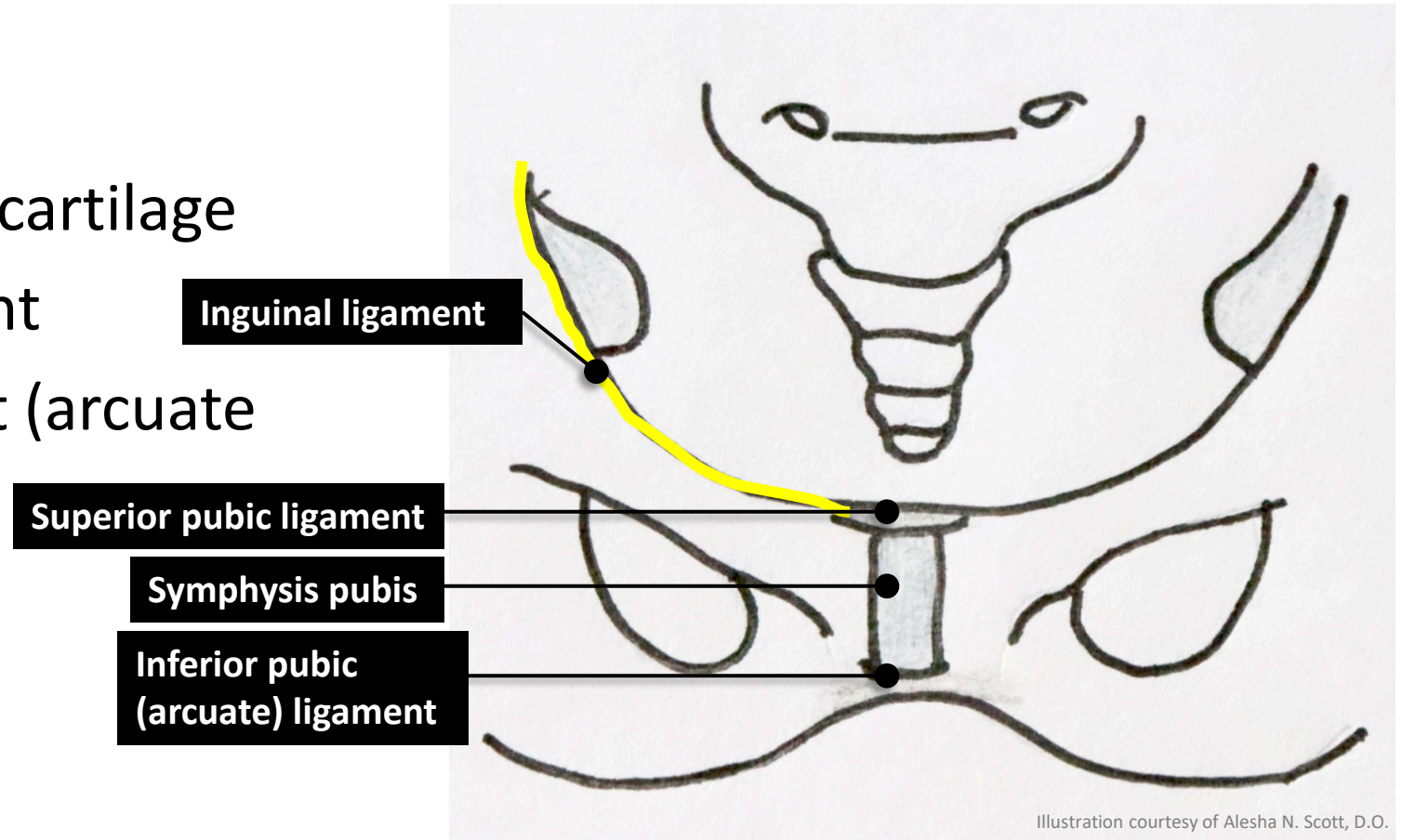


Ligamentous Pelvic Anatomy

Ligamentous Pelvic Anatomy

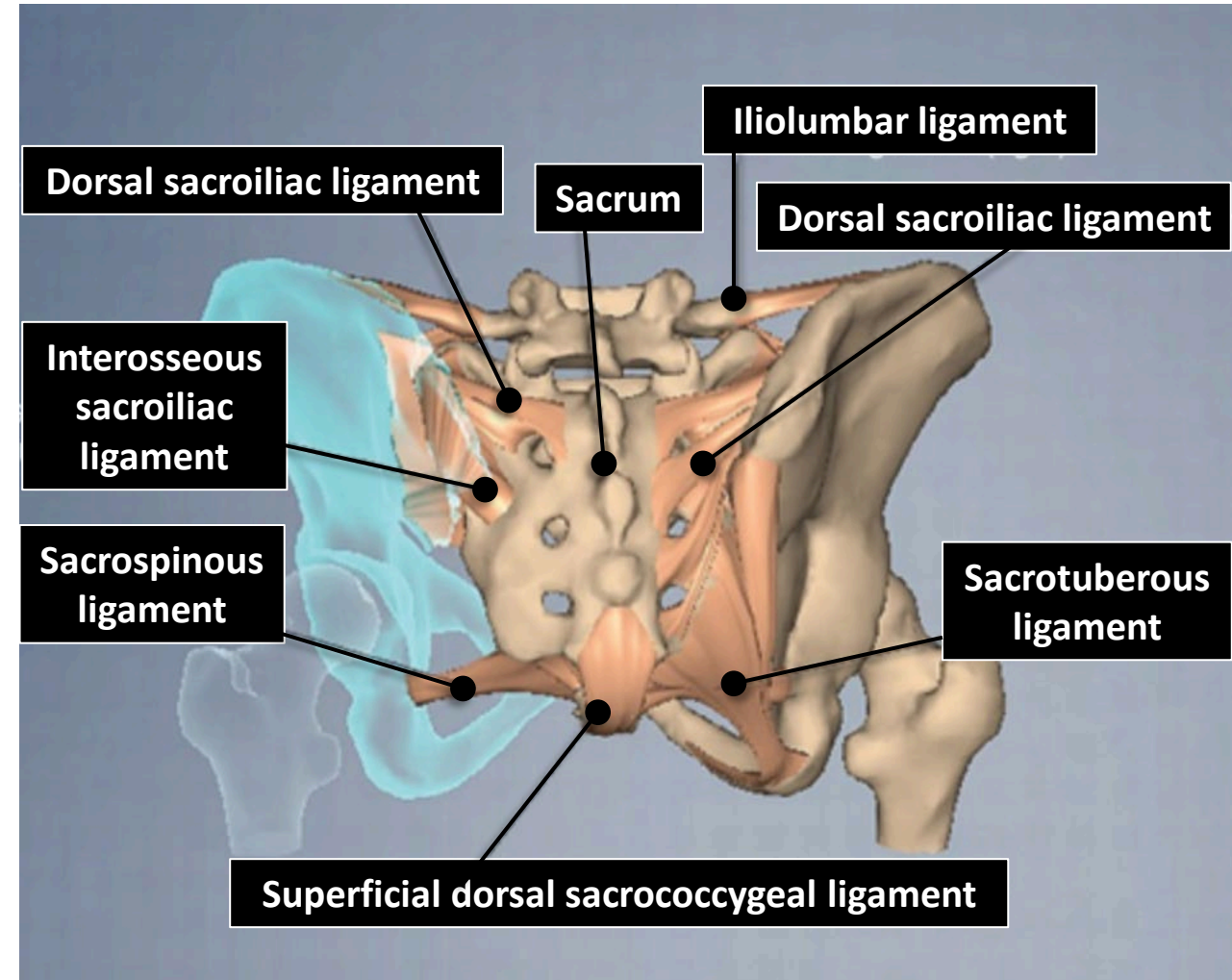
Anterior ligaments

- Symphysis pubis: fibrocartilage
- Superior pubic ligament
- Inferior pubic ligament (arcuate ligament)
- Inguinal ligament



Ligamentous Pelvic Anatomy

- Anterior
 - Symphysis pubis (+superior/inferior pubic ligaments)
 - Inguinal ligament
- **Posterior**
 - Anterior aspect
 - Anterior sacroiliac ligaments
 - Iliolumbar ligament
 - Posterior aspect: strongest
 - Posterior (dorsal) sacroiliac ligaments
 - Interosseous sacroiliac ligaments
 - Iliolumbar ligament
- **Pelvic floor**
 - Sacrospinous ligament
 - Sacrotuberous ligament



Ligamentous Pelvic Anatomy

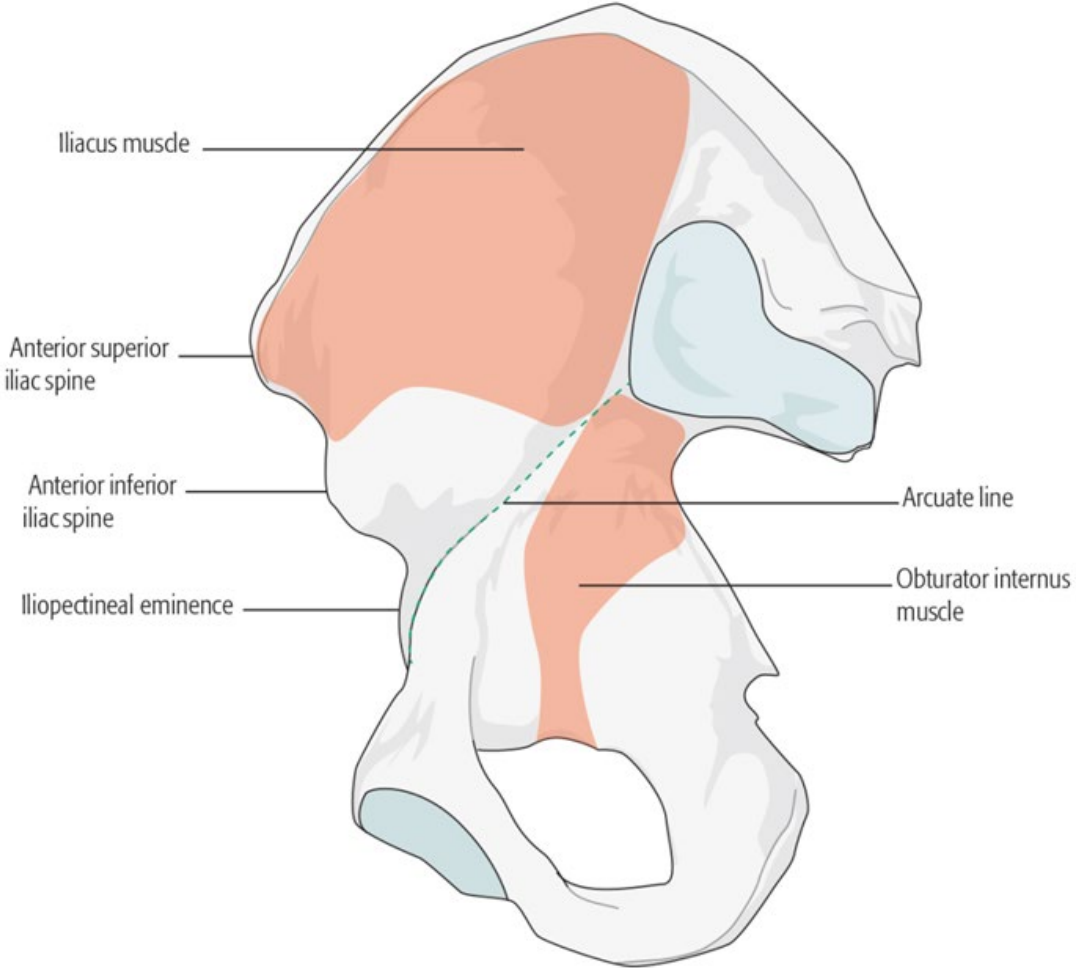
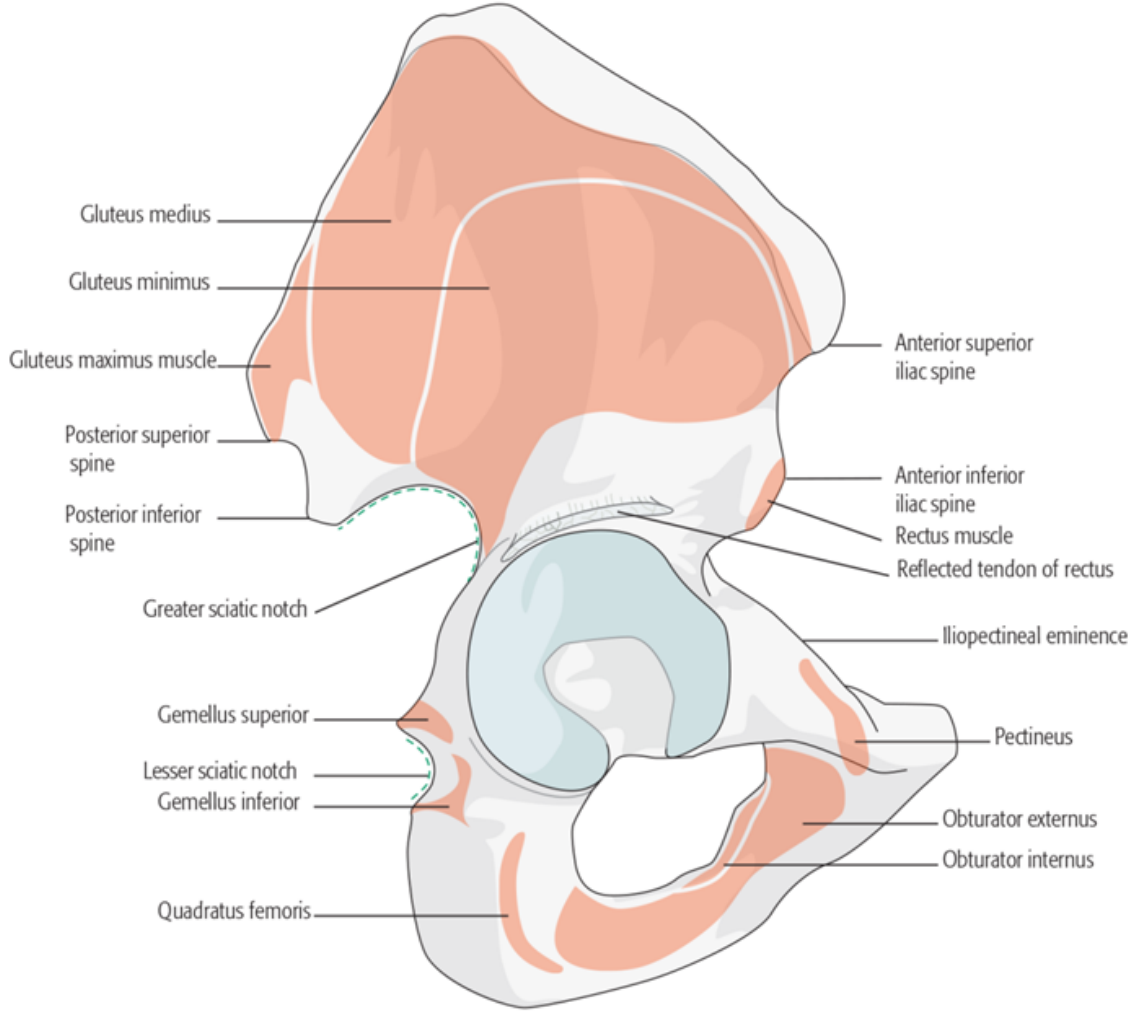
Ligaments

- Anterior SI ligaments → Resist external rotation
- Posterior SI ligament → Resist cranial-caudal translation
- Dorsal sacroiliac ligament → Resist A-P translation
- Iliolumbar ligament → Resist rotation
- Sacrospinous ligament → Resist external rotation
- Sacrotuberous ligament → Resist cranial-caudal translation and flexion

Functions

Muscular Pelvic Anatomy

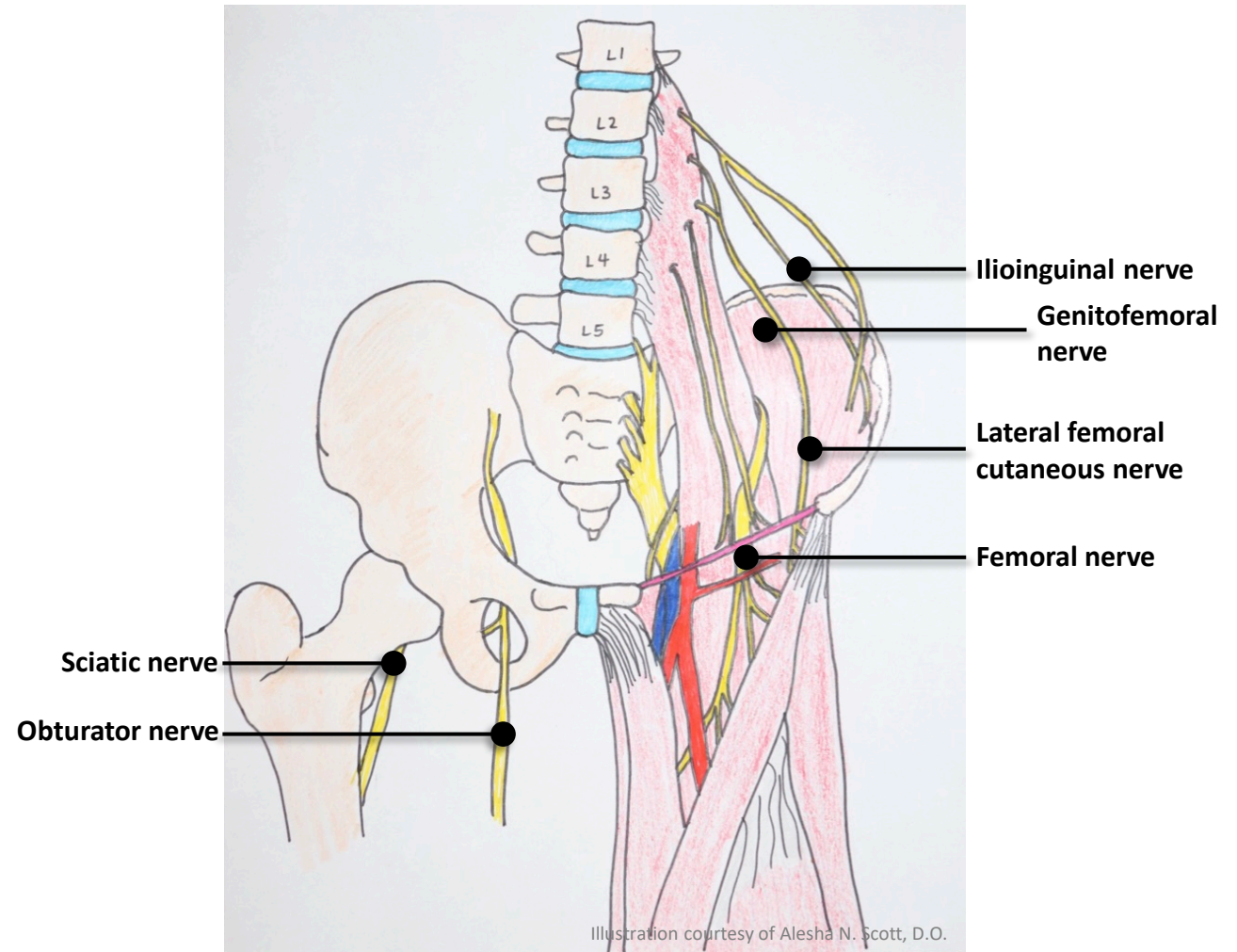
Muscular Pelvic Anatomy



Neurovascular Pelvic Anatomy

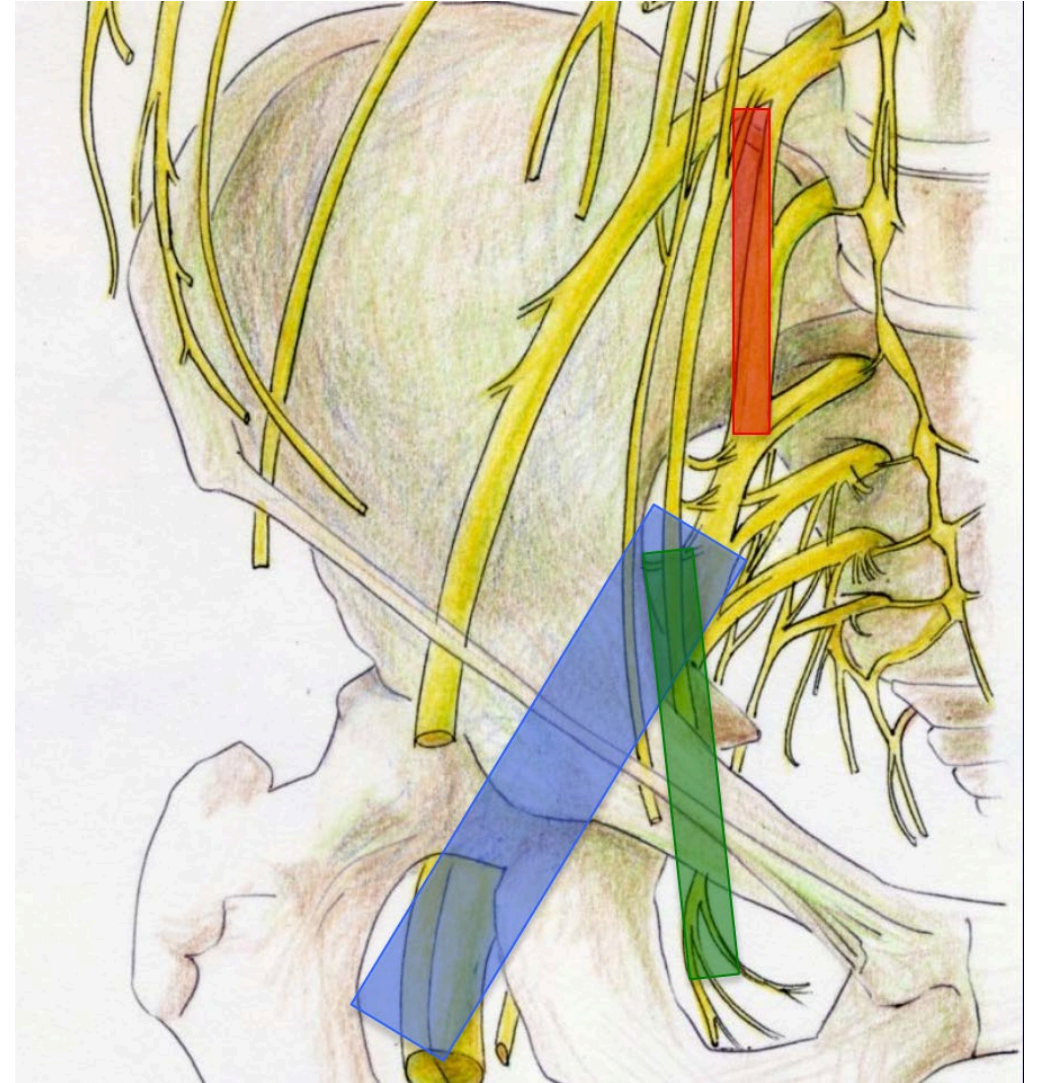
Neural Pelvic Anatomy

- Lumbosacral plexus
 - Iliohypogastric n. (T12-L1)
 - Ilioinguinal n. (L1)
 - Genitofemoral n. (L1-2)
 - Lateral femoral cutaneous n. (L2-3)
 - Femoral n. (L2-4)
 - Obturator n. (L2-4)
 - Lumbosacral trunk
 - Superior gluteal n. (L4-S1)
 - Inferior gluteal n. (L5-S2)
 - Posterior femoral cutaneous n. (S1-3)
 - Pudendal n. (S2-4)
 - Sciatic n. (L4-S3)
 - Peroneal division
 - Tibial division



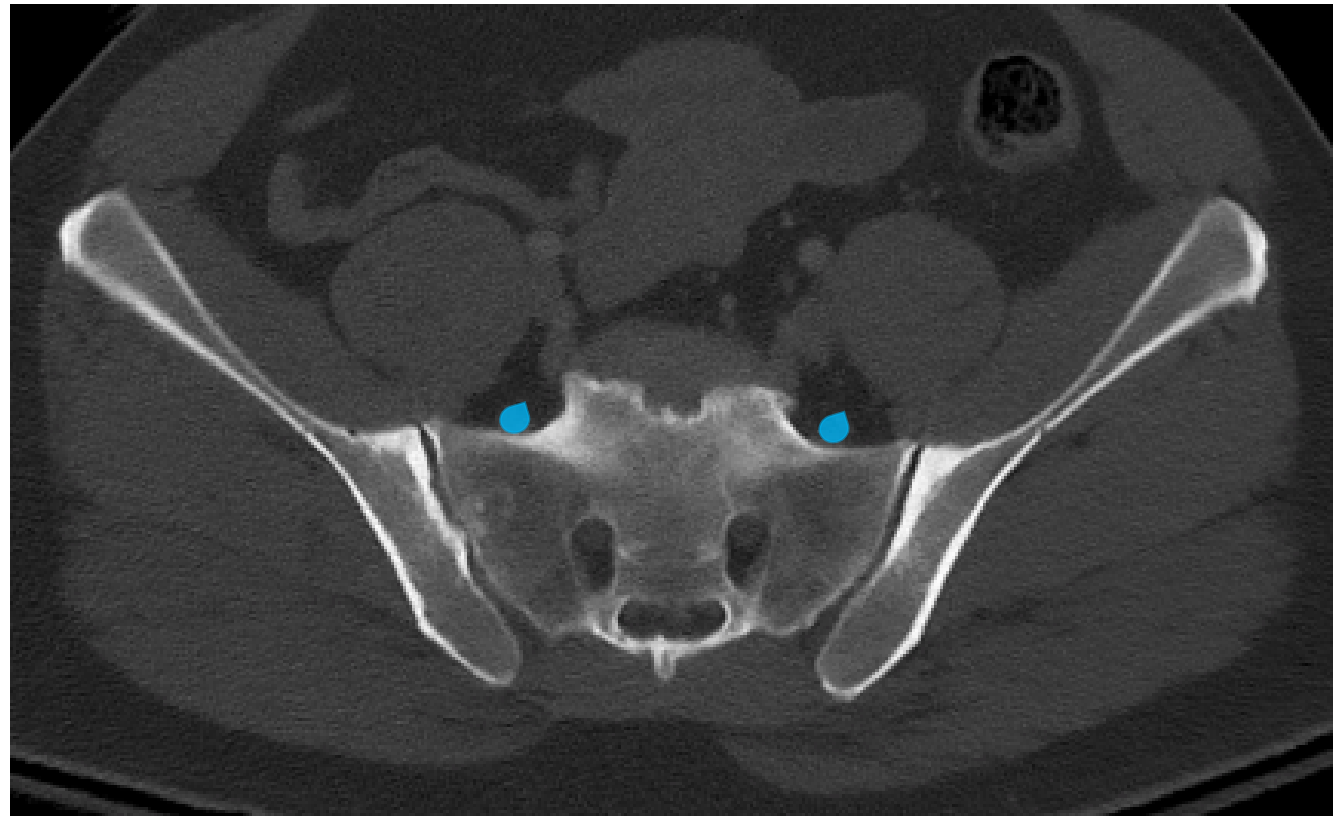
Neural Pelvic Anatomy

- **L4/L5 nerve roots**
 - Courses over anterior sacrum
- **Sciatic Nerve**
 - Exits through greater sciatic notch
- **Obturator nerve**
 - Exits out lateral aspect of obturator foramen



Neural Pelvic Anatomy

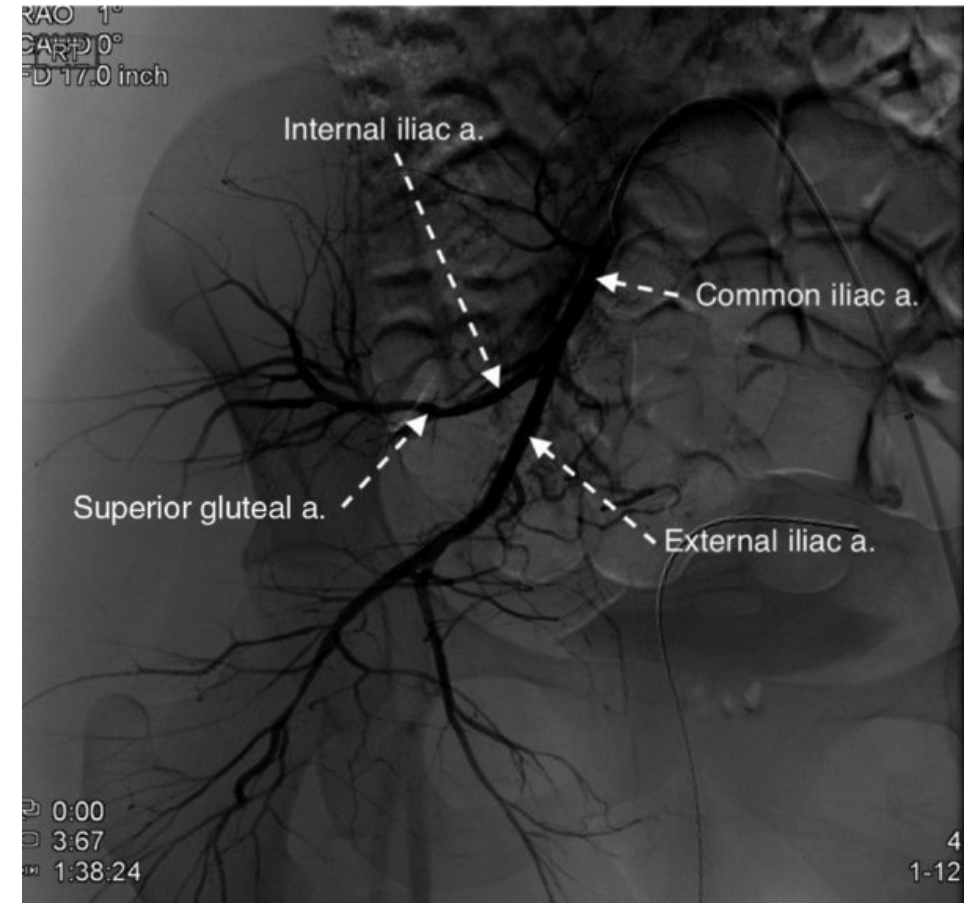
- L5 nerve root at risk with percutaneous iliosacral screw placement
 - 2cm medial to the SI joint



Vascular Pelvic Anatomy

Common iliac system

- External iliac artery
- Internal iliac artery
 - Courses medial to vein and splints into anterior and posterior branches
 - Posterior branch most likely injured
- Sacral venous plexus
 - Majority of the hemorrhage following pelvic ring injuries
 - Close the potential space and allow for tamponade by using a pelvic binder/sheet
 - decreases the volume of the pelvic bowl
 - Center sheet/binder on greater trochanters

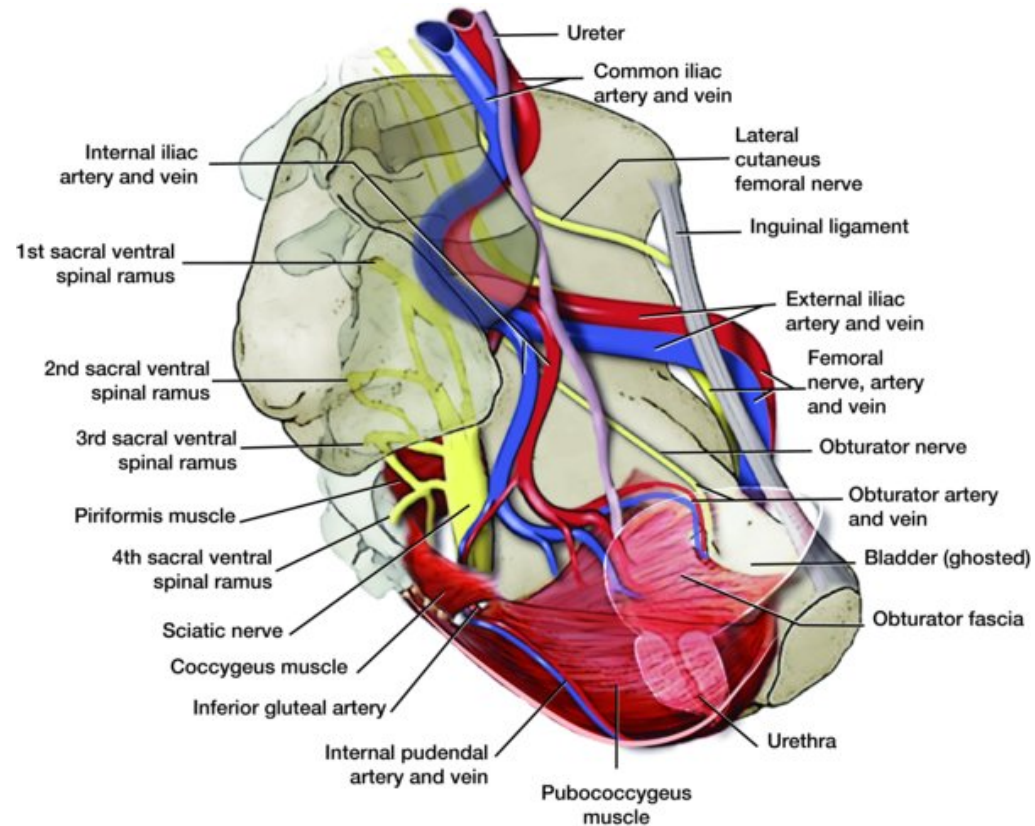


Animesh Agarwal. Pelvic Ring Injuries. In: Tornetta P, Ricci WM, eds. Rockwood and Green's Fractures in Adults, 9e. Philadelphia, PA. Wolters Kluwer Health, Inc; 2019. Figure 49-28.

Vascular Pelvic Anatomy

Internal iliac system

- Anterior division
 - Visceral branches
 - Obturator a.
 - Inferior vesical a.
 - Middle rectal a.
- Posterior division
 - Superior gluteal a.
 - Iliolumbar a.
- Limb/perineal branches
 - Inferior gluteal a.
 - Internal pudendal a.

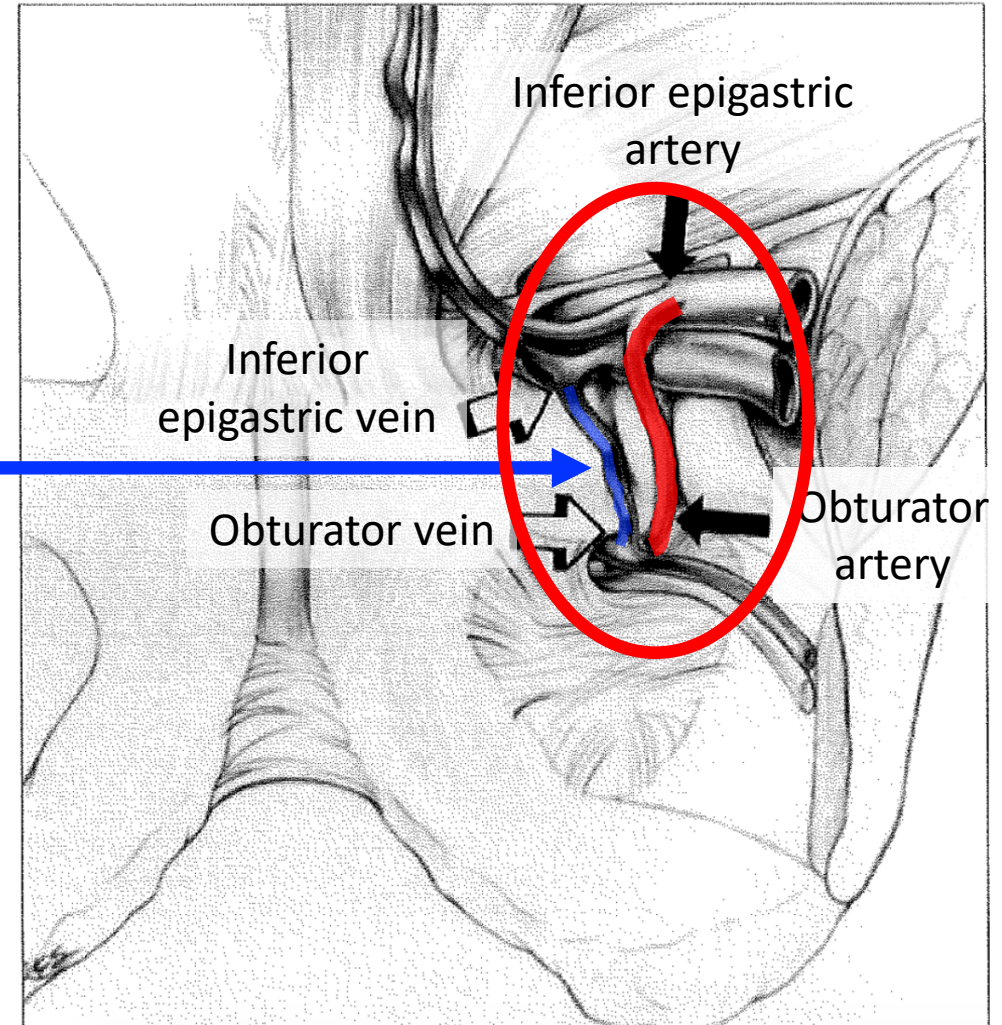


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Vascular Pelvic Anatomy

Retropubic anatomy

- **Small caliber anastomosis** between obturator and external iliac/inferior epigastric systems are common (~70%)
 - Average of 6.2cm lateral to the symphysis
- In small percentage, obturator artery can be of large caliber and originate from inferior epigastric or external iliac
 - **“Corona mortis”**

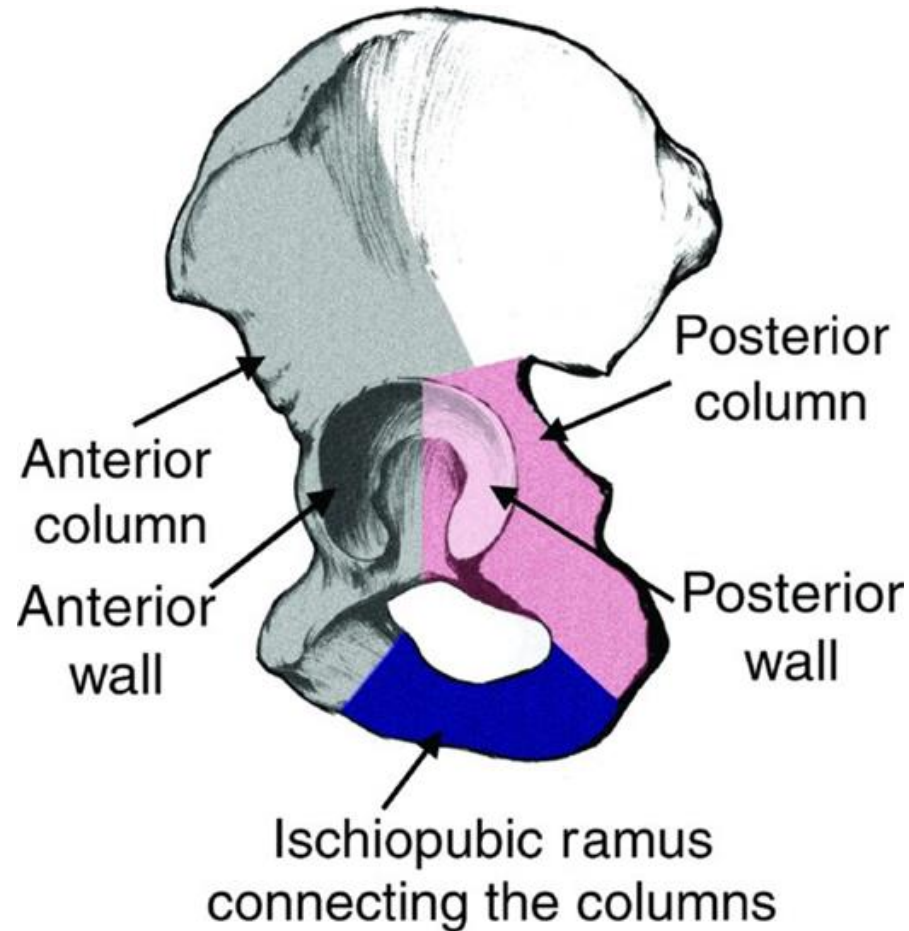


Teague DC, Graney DO, Routh ML Jr. Retropubic vascular hazards of the ilioinguinal exposure: a cadaveric and clinical study. J Orthop Trauma. 1996;10(3):156-9. Figure 1.

Acetabular Anatomy

- Osteology
- Ligamentous
- Neurovascular

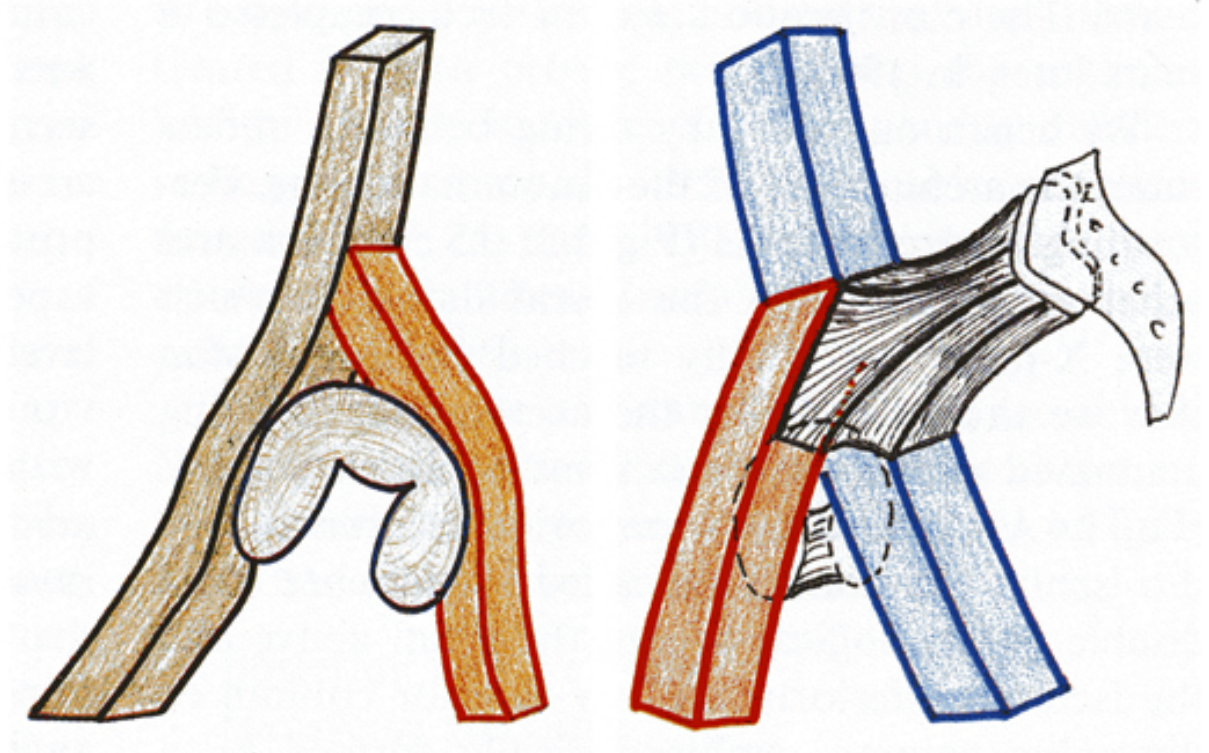
Acetabular Osteology



Berton R. Moed and John A Boudreau. Acetabulum Fractures. In: Tornetta P, Ricci WM, eds. Rockwood and Green's Fractures in Adults, 9e. Philadelphia, PA. Wolters Kluwer Health, Inc; 2019. Figure 50-8.

Acetabular Osteology

- Inverted “Y” two column concept
 - Described by Judet and Letournel (1966)
- Columns connected to SI joint by thick area of bone above sciatic notch (sciatic buttress)
- Anatomical roof of acetabulum forms keystone of arch



Acetabular Osteology

Anterior column

- Extends from anterior iliac crest to pubic symphysis
- 3 segments
 - Iliac segment
 - Acetabular segment
 - Pubic segment

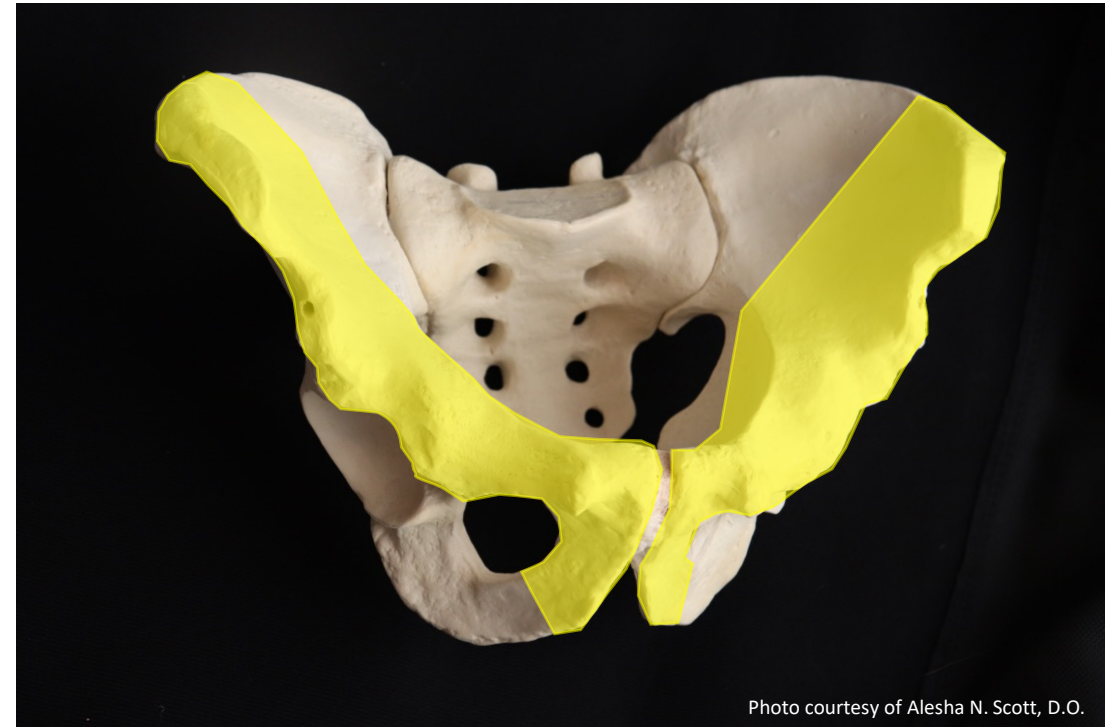
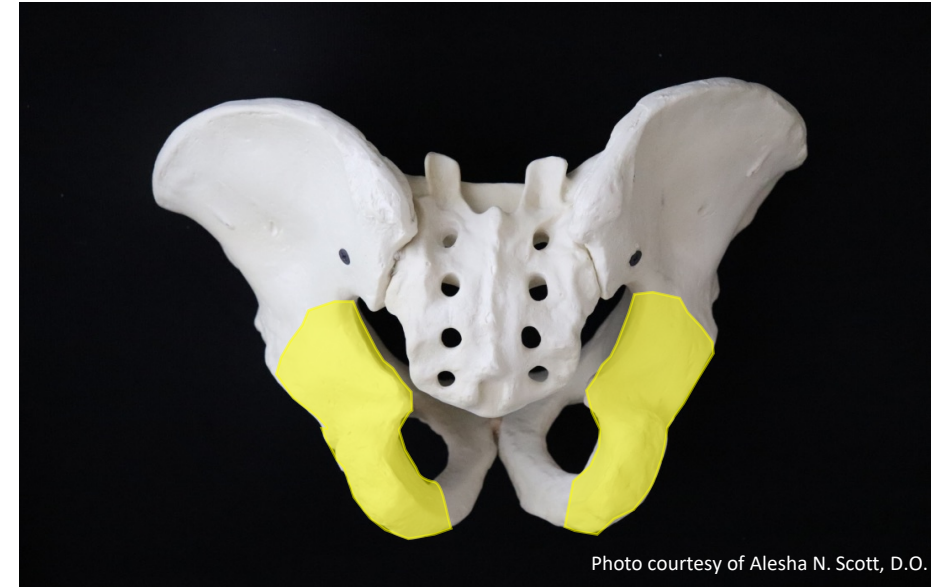


Photo courtesy of Alesha N. Scott, D.O.

Acetabular Osteology

Posterior column

- Extends from greater sciatic notch to inferior ischium
- 2 segments
 - Posteroinferior portion of ilium
 - Greater and lesser sciatic notches
 - Ischium



Acetabular Osteology

Anterior wall

- Iliopectineal eminence
 - Represents the anterior and medial boundary of the acetabulum
 - Iliopsoas runs just lateral to the eminence

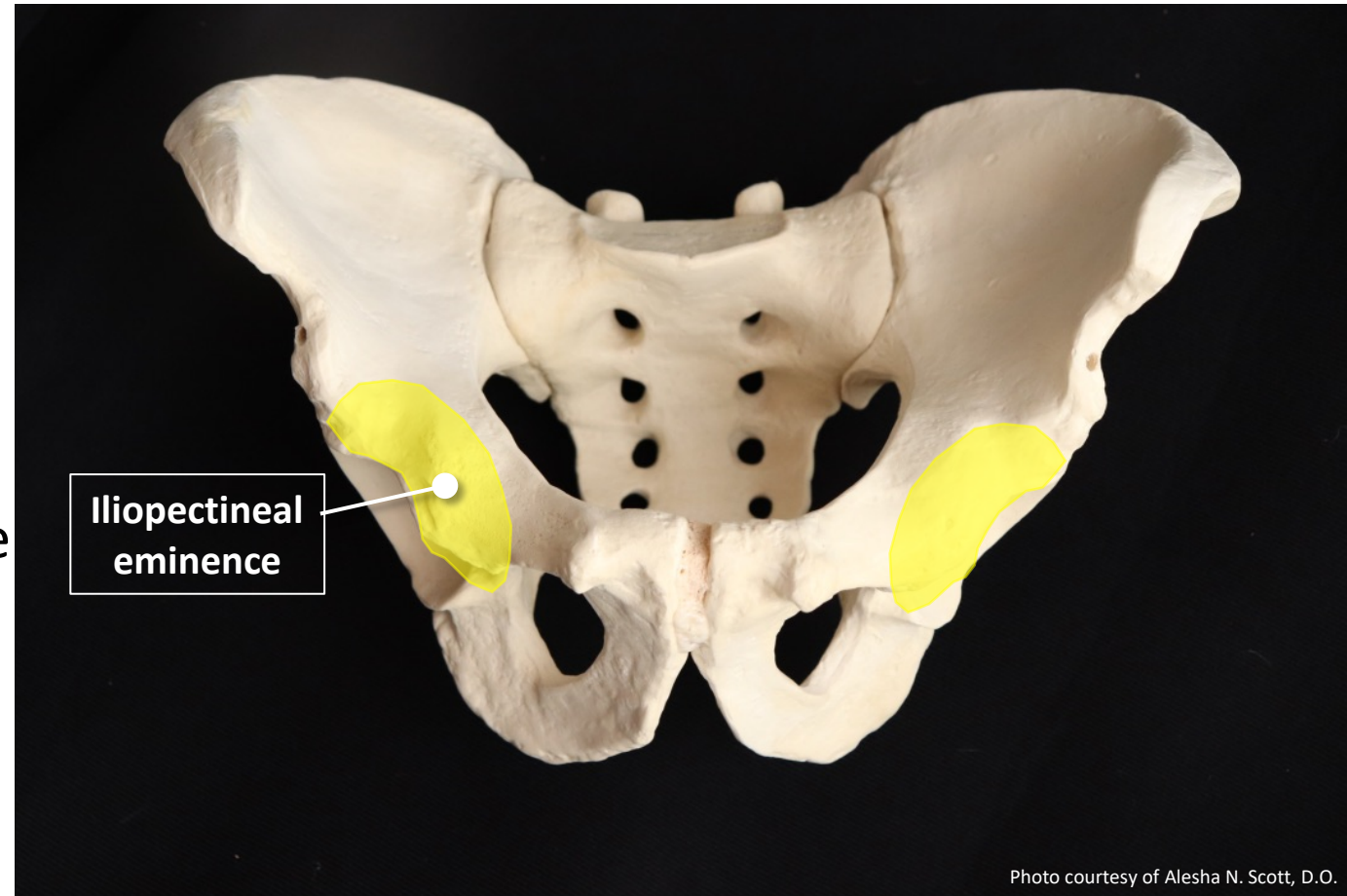


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Acetabular Osteology

Posterior wall

- Most common acetabular fracture type



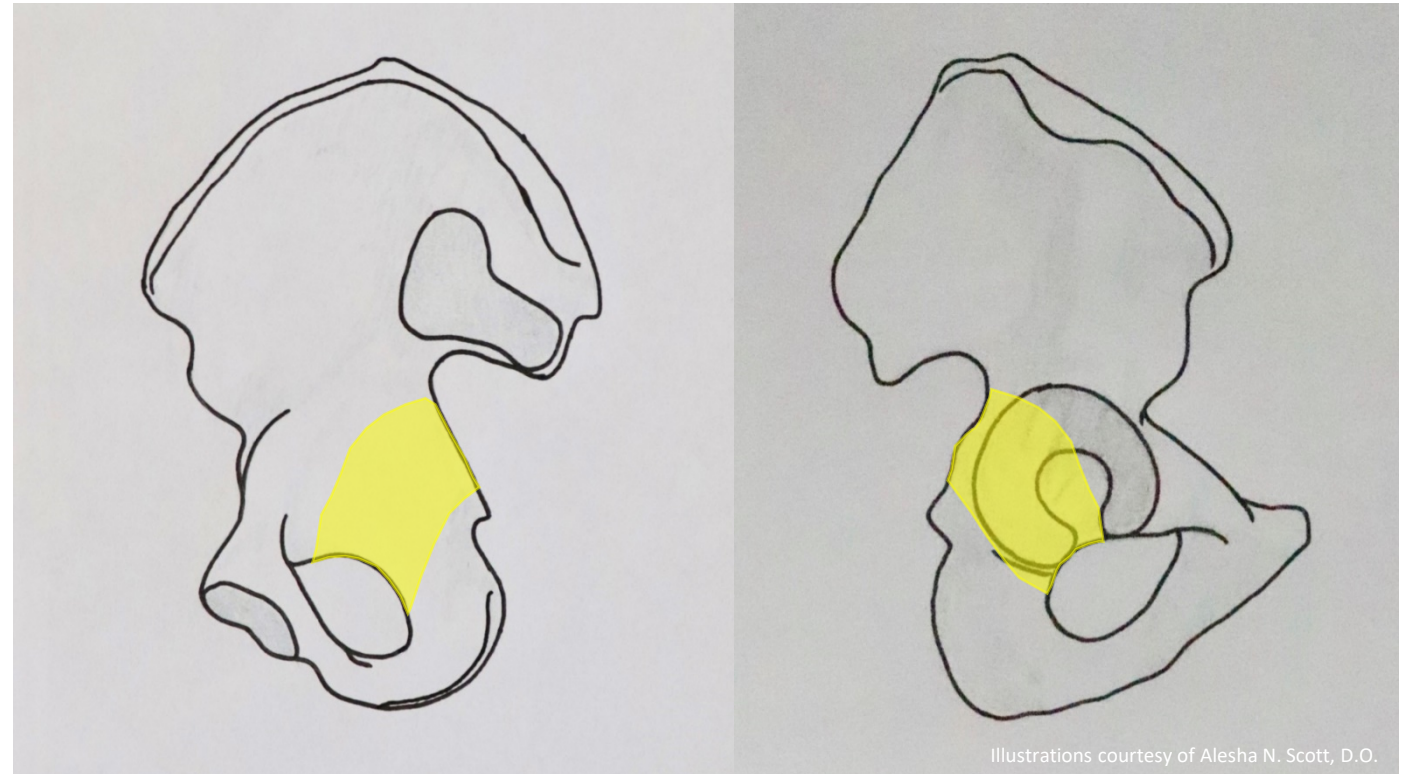
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Acetabular Osteology

Medial wall

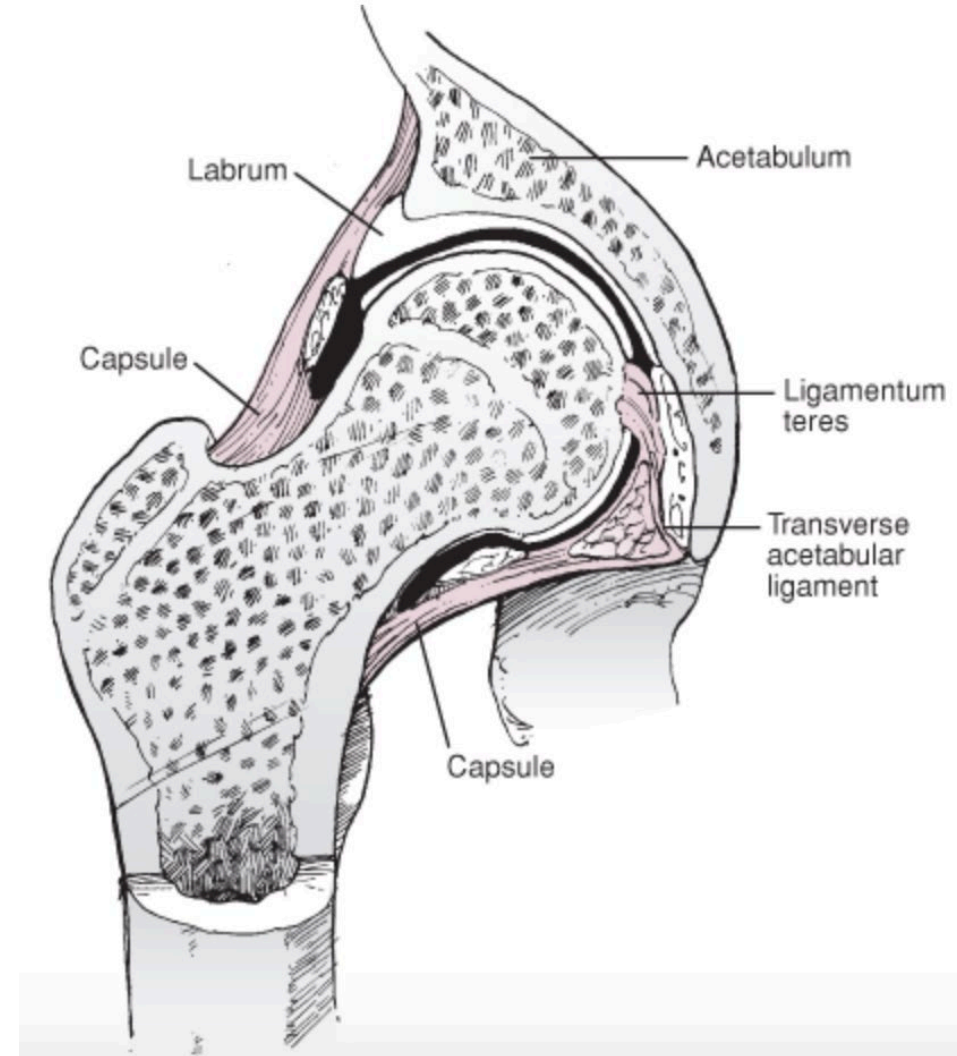
- Quadrilateral surface + acetabular fossa
- Commonly involved in geriatric acetabular fracture patterns



Ligamentous Acetabular Anatomy

Ligamentous Acetabular Anatomy

- Capsule
- Labrum
- Ligamentum teres
- Transverse acetabular ligament

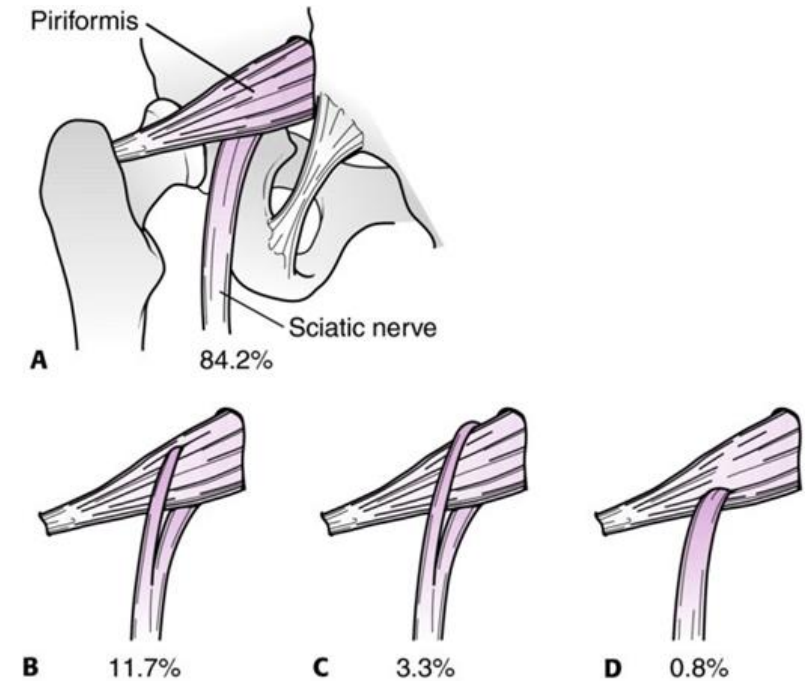
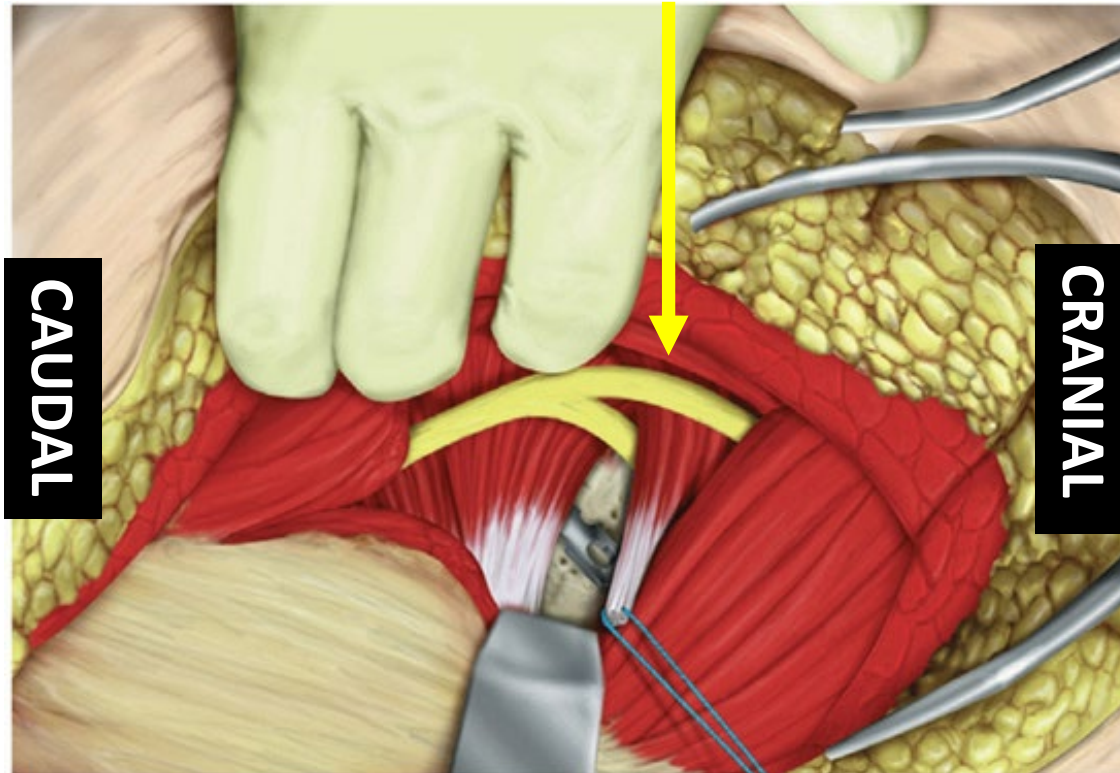


Michael S. Kain and Paul Tornetta III. Hip Dislocations and Femoral Head Fractures. In: Tornetta P, Ricci WM, eds. Rockwood and Green's Fractures in Adults, 9e. Philadelphia, PA. Wolters Kluwer Health, Inc; 2019. Figure 51-12.

Neurovascular Acetabular Anatomy

Neural Acetabular Anatomy

- Sciatic nerve
 - Recognize variant anatomy!



Berton R. Moed and John A Boudreau. Acetabulum Fractures. In: Tornetta P, Ricci WM, eds. Rockwood and Green's Fractures in Adults, 9e. Philadelphia, PA. Wolters Kluwer Health, Inc; 2019. Figure 50-50.

Michael S. Kain and Paul Tornetta III. Hip Dislocations and Femoral Head Fractures. In: Tornetta P, Ricci WM, eds. Rockwood and Green's Fractures in Adults, 9e. Philadelphia, PA. Wolters Kluwer Health, Inc; 2019. Figure 51-14.

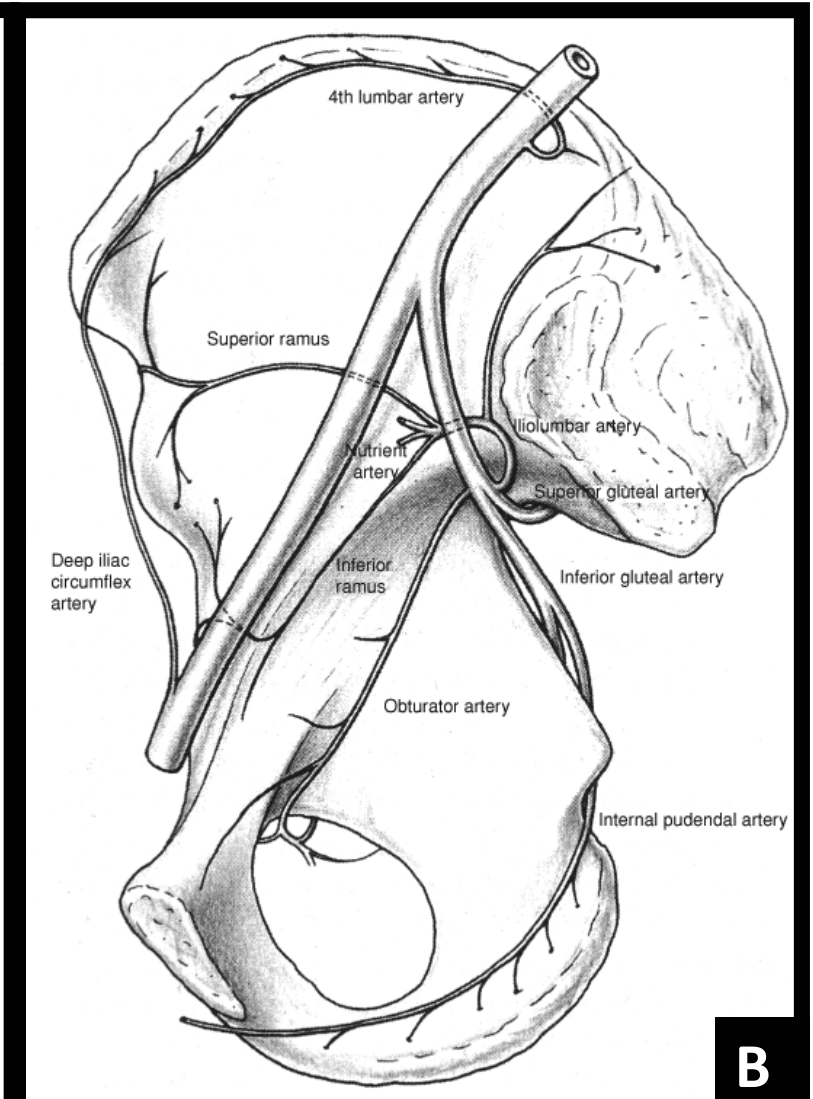
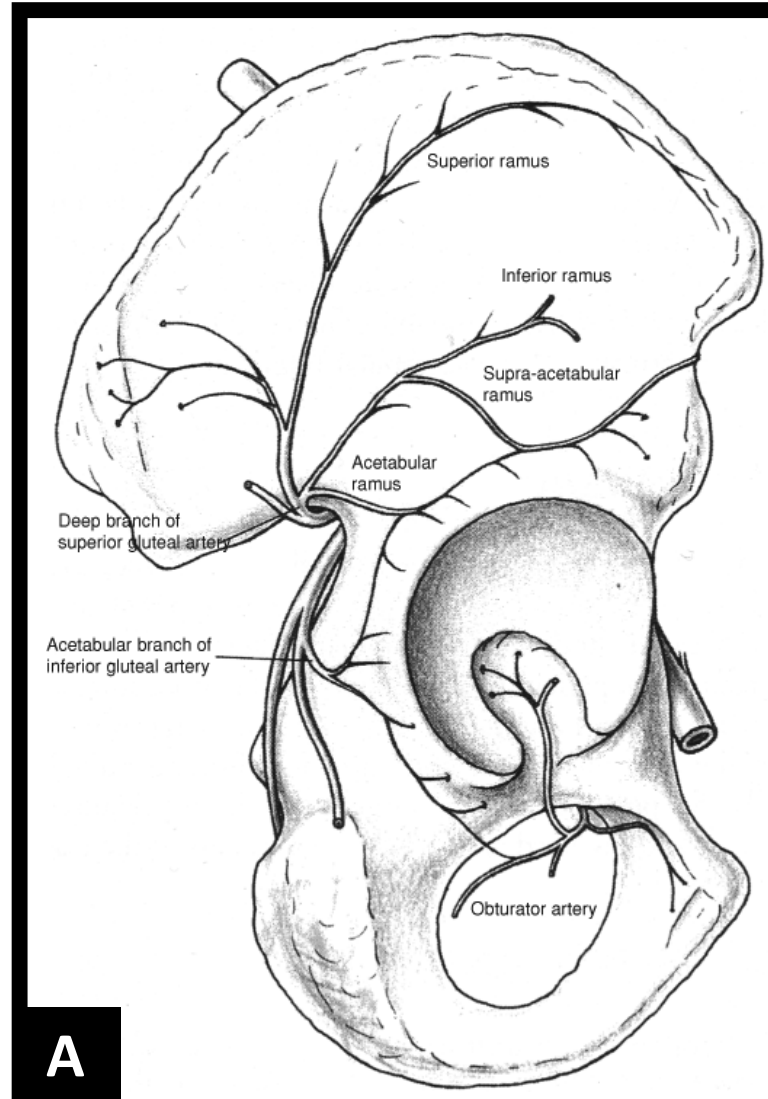
Vascular Acetabular Anatomy

- **Lateral (A)**

- Superior gluteal artery
- Inferior gluteal artery
- Medial femoral circumflex artery

- **Medial (B)**

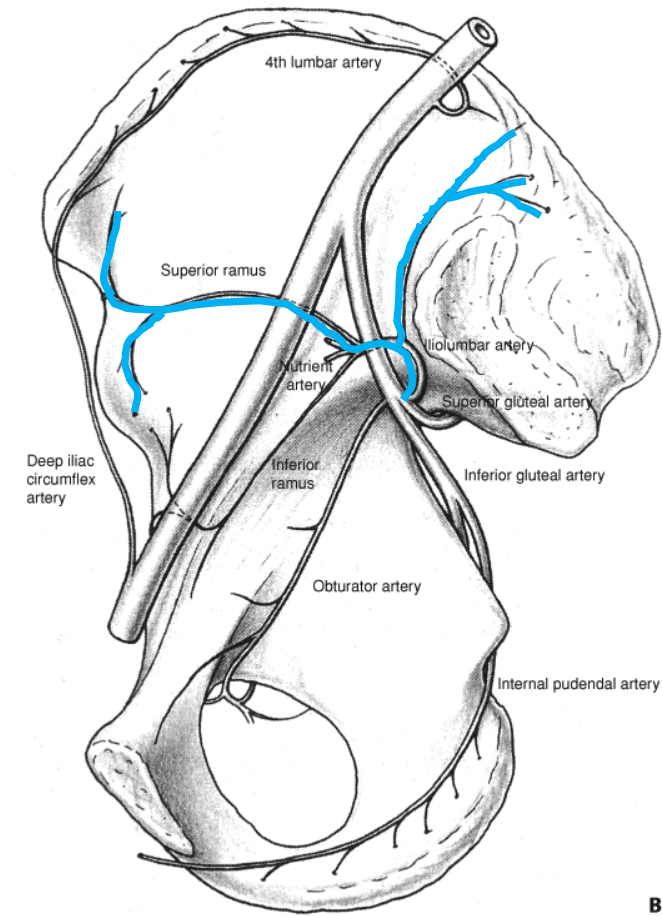
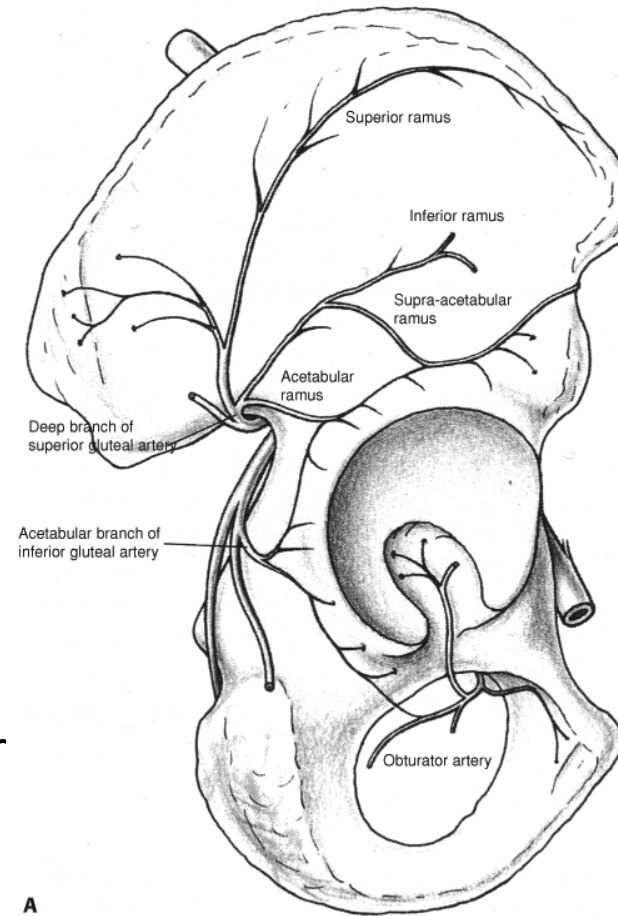
- Iliolumbar artery
- Obturator artery



Vascular Acetabular Anatomy

Iliolumbar artery

- Origination
 - From posterior trunk of internal iliac OR from the obturator
- Divisions
 - Superficial branch
 - Deep branch
 - Nutrient artery to ilium → 50% enter ilium anterior to SIJ, lateral to pelvic brim; 50% enter medial to pelvic brim

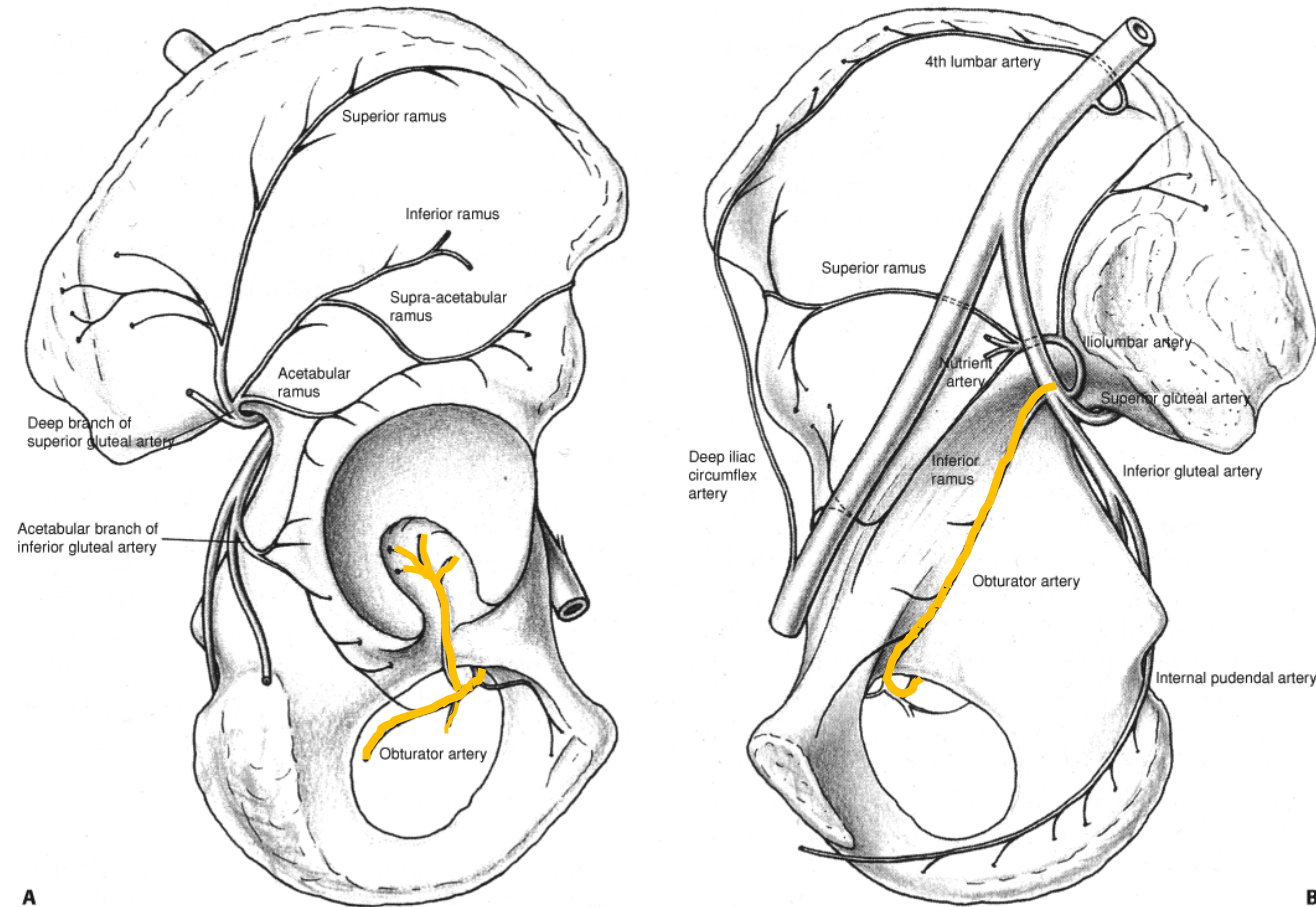


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Vascular Acetabular Anatomy

Obturator artery

- Branches
 - Quadrilateral surface
 - Superior pubic ramus
 - Acetabular branch
 - Enters deep to transverse ligament
 - May be the terminal supply to acetabulum
- Anastomosis
 - With MFCA

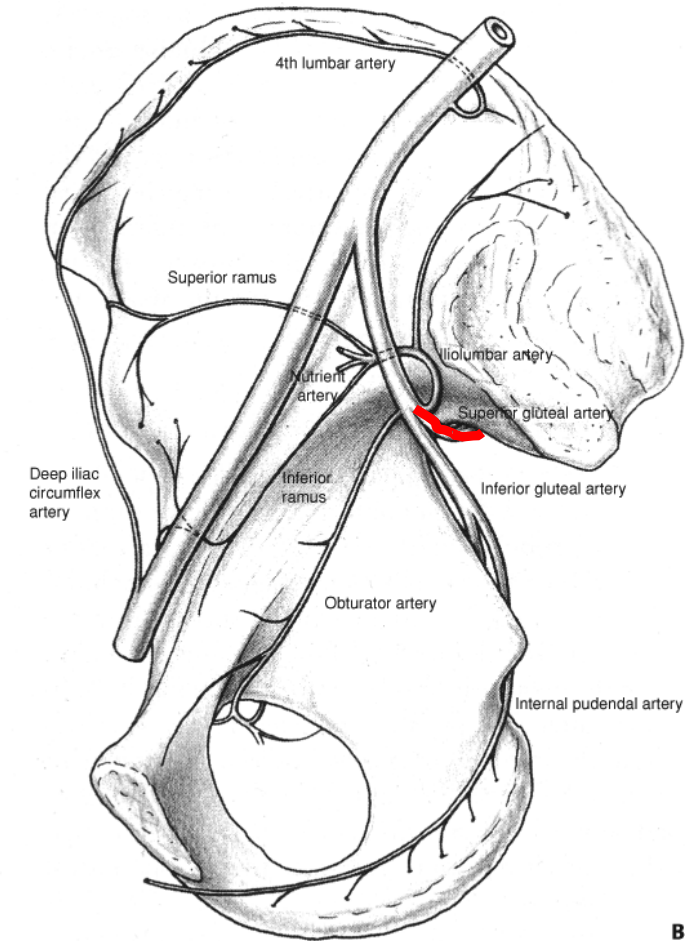
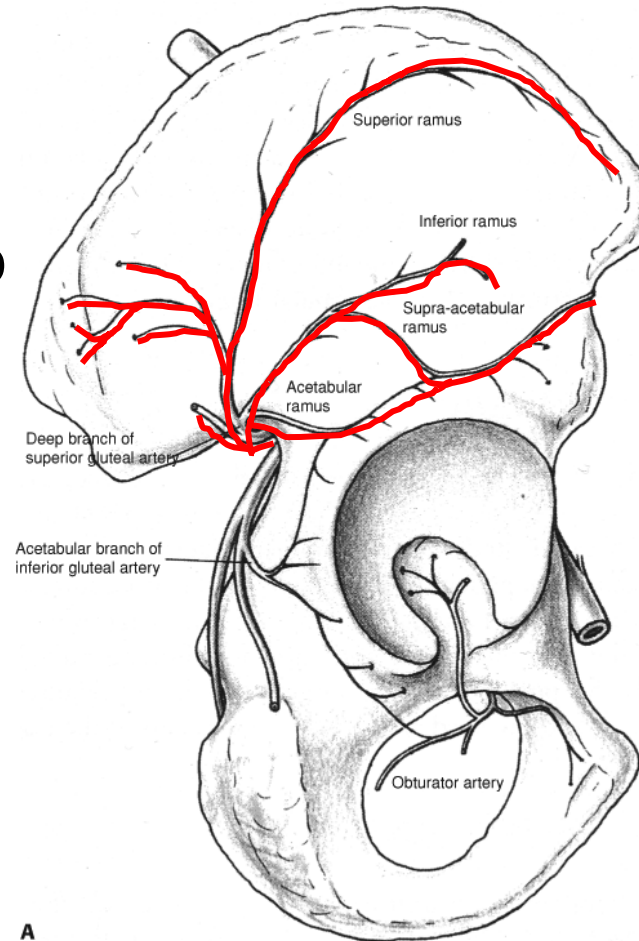


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Vascular Acetabular Anatomy

Superior gluteal artery (SGA)

- Most important contribution to acetabular blood supply
- Branches
 - Deep
 - Superior
 - Inferior
 - Supraacetabular
 - Acetabular

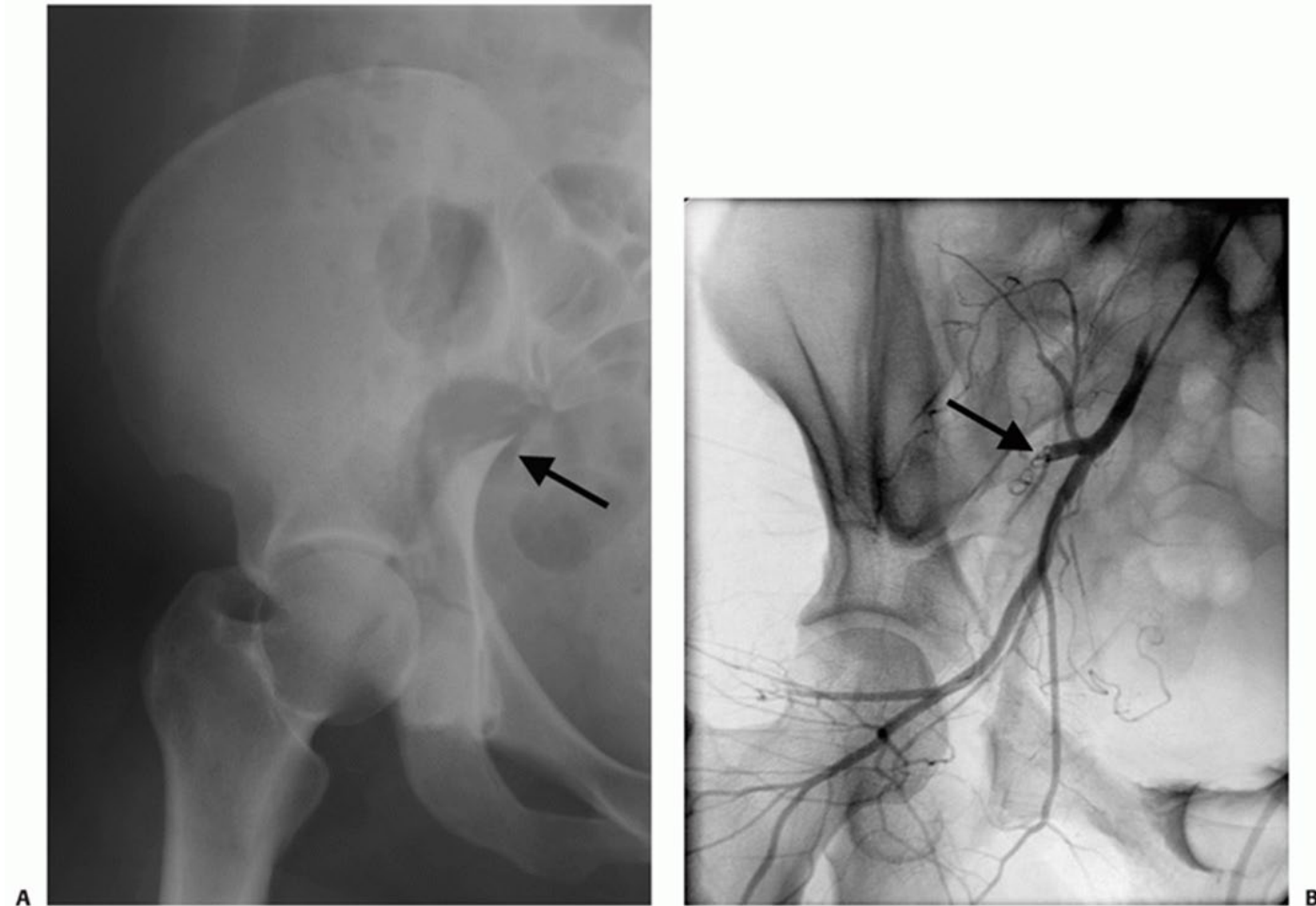


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Vascular Acetabular Anatomy

Superior gluteal artery (SGA)

- May be lacerated secondary to injury or retractor placement in the greater sciatic notch

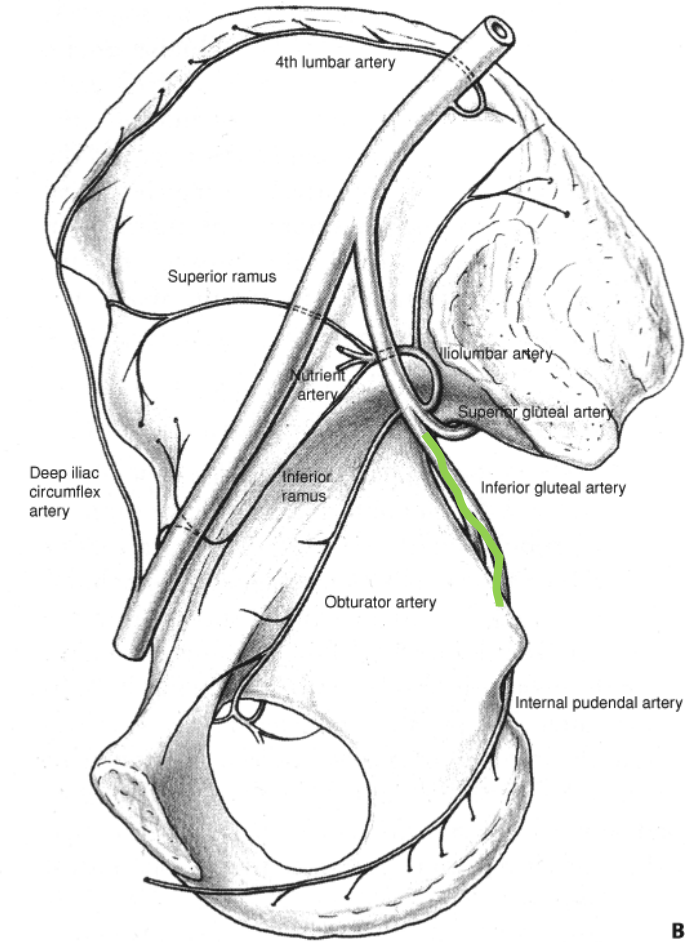
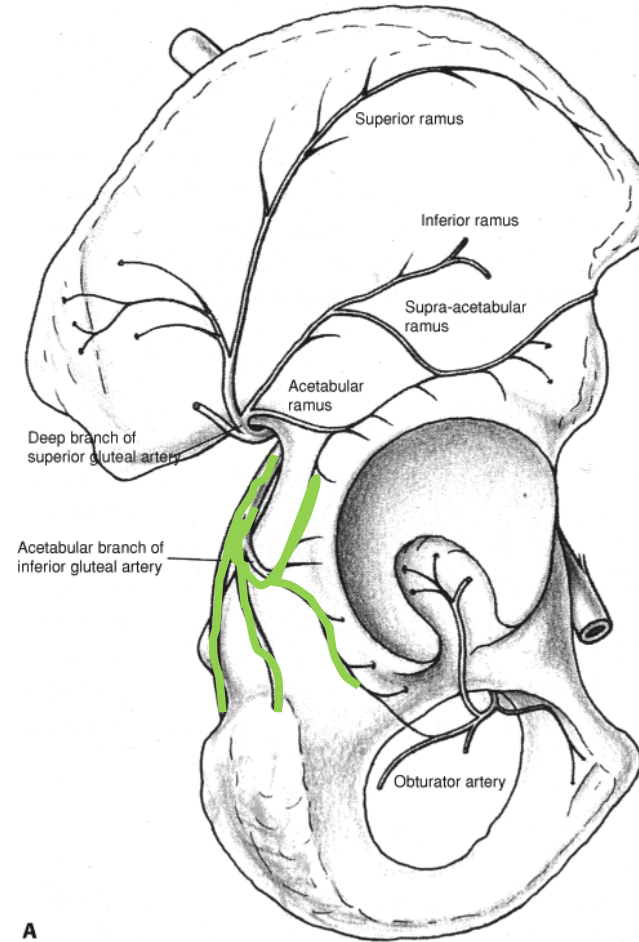


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Vascular Acetabular Anatomy

Inferior gluteal artery (IGA)

- Acetabular branches
 - Deep to short external rotators
 - Between inferior gemellus and quadratus femoris
 - Anastomosis with MFCA

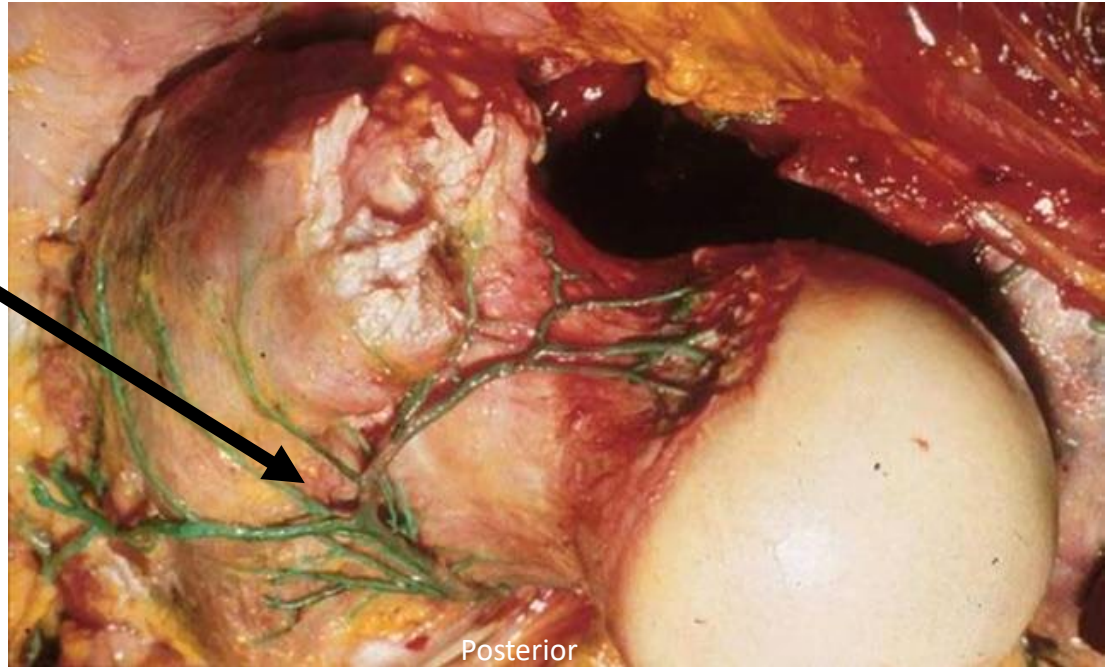


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Vascular Acetabular Anatomy

Medial femoral circumflex artery (MFCA)

- Ascending branch is main blood supply to femoral head
- Deep to quadratus, obturator internus, and piriformis
- Can be damaged with
 - Dislocation of femoral head
 - Taking down quadratus from femur
 - Dissecting piriformis and obturator internus tendons off femur without adequate 1 cm tag



Objectives Completed

- Learn the anatomy of the pelvis and acetabulum
 - Osteology
 - Ligamentous
 - Muscular
 - Neurovascular
- Differentiate the palpable landmarks

References

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